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The emotional experience of hospital workers and the public in an infectious disease outbreak

: Implications for disaster management

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보건학과 보건정책관리학전공

손 희 정

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Abstract

The emotional experience of hospital workers and the public in an infectious disease outbreak

: Implications for disaster management

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The Middle East Respiratory Syndrome outbreak in South Korea in 2015 was a social disaster that resulted substantial human loss. In the outbreak, a significant numbers of people were infected and died, and as a result, the society suffered from a high level of emotional distress. In such a situation, active emotional support was necessary; however, in an actual response, the emotions of those affected were widely disregarded by the public health authority and the central government during the outbreak.

This dissertation attempts to reduce such gap between requirements and practices observed in providing emotional support during an outbreak. Accordingly, the evidences on the emotions people experience during an outbreak and the influences of those emotions were produced using multiple methods. Then, from the evidences, implications were be drawn to improve

the management of a social disaster caused by an outbreak. Lastly, the directions for future studies were proposed. Under the purposes, three studies were designed focusing on the two key groups of people during an outbreak: Study 1 and Study 2 focused on hospital workers and Study 3 focused on the public.

Study 1, using a quantitative approach, investigated the negative emotions of hospital workers and the effects of those emotions on their social functioning after an outbreak. For the investigation, the concept of resilience and the models that explain the process of resilience were adopted. From the results, it was found that the high level of negative emotions was associated with the indicators of low resilience—high level of likelihood of post-traumatic stress disorder after an outbreak and unwillingness to work in a future outbreak. In addition, the mediation of other prominent factors—appraisal of risk and personal resource—by emotional experience was observed.

Study 2 further investigated emotions of hospital workers during an outbreak. In the study, the discrete emotions of the hospital workers and the stressors that trigger those emotions were explored using a qualitative approach. The analysis revealed diverse negative emotions—anger, anxiety, fear, sadness, disgust, and shame/guilt—and also, four themes of the triggers. Specifically, anxiety, fear, and sadness were provoked by the theme “my workplace becoming an unsafe area”; anger and sadness, by the theme “stigmatization on myself and my family”; anger, anxiety, disgust, sadness, shame/guilt, and stress, by the theme “mistake, missing, and delay due to communication failure”; and sadness and stress, by the theme “mistrust and

blame for of responsiveness."

Study 3, using a quantitative approach, investigated the construction of primary emotions of the public during an outbreak and the effects of those emotions on the risk perception after an outbreak as well as the protective behaviors during an outbreak. The discrete emotions—fear, anger, and anxiety—were used, and the differences among them in their construction and the effect on the subsequent responses were examined. The results found fear and anger were induced by the appraisal of non-dailiness. Furthermore, the protective behaviors of avoidance were induced by all emotions, while those of approach were induced only by anger. The risk perception after an outbreak, however, was not influenced by the emotions.

This dissertation has several theoretical contributions. It expanded the understanding of the emotions of people during an outbreak. Also, it contributed to the specification of the effects of emotions on the resilience of hospital workers. Lastly, this dissertation specifies the different roles of the discrete emotions—fear, anger, and anxiety—on the behaviors of the public during an outbreak and the risk perception after the outbreak.

Also, the practical implications for more effective management of a disaster caused by an outbreak were proposed as well. For hospital workers, implications for human resource management in preparing outbreaks were drawn. That is, building of emotional capacity of the hospital workers is necessary to reduce emotional disruption during an outbreak and facilitate resilience after an outbreak. It is also equally important to construct a protective environment for hospital workers. The triggers behind the negative emotions and stress, which were identified as stressors that undermined the

emotional responses of hospital workers, should be mitigated by managerial efforts. For the public, the implication for more effective public communication during an outbreak was drawn. When an outbreak occurs, the public health authority should immediately screen the emotional reactions of the public. Then, the messages tailored by the emotions should be sent out in a timely and accurate manner to promote the public's healthy behaviors during an outbreak.

Key Words: disaster management, infectious disease outbreak, emotions, hospital workers, the public
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1. Introduction

1.1. Background

Since the 21st century, there has been a continued crisis caused by emerging infectious diseases worldwide. In 2003, the Severe Acute Respiratory Syndrome (SARS) was first reported in Asia and then spread globally, infecting 8,098 people ("Fact Sheet Covering Basic Information about SARS," Center for Disease Control and Prevention [CDC], 2004). Among them, 774 died. Novel swine-origin influenza A (H1N1) was estimated to infect approximately 60.8 million, hospitalized 274,304, and caused death to 12,469 people in the United States alone from 2009 to 2010 ("CDC Estimates of 2009 H1N1 Influenza Cases, Hospitalizations and Deaths in the United States," CDC, n.d.). Ebola infected 15,227 people and caused 11,310 deaths in West Africa in 2014 ("2014–2016 Ebola Outbreak in West Africa," CDC, n.d). Similarly, during the Middle East Respiratory Syndrome (MERS) outbreak in 2015 in South Korea, 186 individuals were infected, 38 died, and 16,752 were quarantined in a span of approximately two months[1].

An infectious disease outbreak can be mistakenly regarded as a natural disaster when the focus is on the source of the disease virus. However, the disease outbreak is one of the social disasters defined by the law of disaster and safety management of South Korea[2]. A social disaster is characterized

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1) The MERS outbreak in South Korea started on May 20, 2015 with a laboratory confirmation of the first case. Its de facto end was announced by the public health authority on July 28, and its formal end according to the World Health Organization (WHO) guideline was on December 23.

2) In the law of disaster and safety management, a disaster is defined as something

by a difficulty of early detection and notification, and consequently, a high risk of human loss which causes emotional distress to the society. Therefore, the nation's response to an infectious disease outbreak should take high priority to manage such emotional distress of indirectly affected ones (rescuers and community members) as well as directly affected victims. When the level of human loss and emotional distress is exceeding—for instance, when there are directly affected victims, the direct impact of the disaster lasts for more than three days, or there are more than 100 indirectly affected victims—a very active emotional support is recommended (Jeong, 2017).

According to the recommendation, the 2015 MERS outbreak is clearly a disaster that needed a systematic emotional support to the society. However, in the entire process of the response of the public health authority and central government, emotions of the people under direct and indirect influences were widely disregarded. As Choi, Kim, Moon, and Kim (2015)

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that can possibly cause harm to the public's lives, bodies, and properties, as well as to the nation. Two kinds of disasters are described in the law. (1) A natural disaster is described as a typhoon, flood, heavy rain, strong wind, storm, tsunami, heavy snow, lightning, drought, earthquake, yellow dust, massive volume of algae, tidal water, volcanic activity, falling and collision of asteroids or meteoroids, and other similar natural phenomena. (2) A social disaster is described as a damage that exceeds the scale prescribed by the Presidential Decree; the paralysis of a nation's basic infrastructure—such as energy, communications, traffic, finance, medical care, and water supply system—caused by fire accidents, a collapse, explosions, traffic accidents (including air accidents and accidents), chemical/biological/radiological accidents, and environmental pollution accidents; and a damage caused by the spread of an infectious disease defined in the Act on the Prevention and Management of Infectious Diseases, or the spread of livestock infectious diseases defined by the Act on Livestock Infectious Diseases Prevention (homepage of the South Korea's Ministry of Government Legislation [http://www.law.go.kr]).

pointed out, the negligence were observed in multiple aspects. For example, in the initial stage of the MERS outbreak, the public health authority decided not to disclose the information of the hospitals where the patients with MERS visited or stayed in. This not only contributed to the spread of disease by impeding hospitals' early awareness of the disease occurrence and proper preparation for the visit of potential patients, but also made the public suffer from fear and anxiety.

Also, without being sympathetic with the public's emotional reactions to the unknown disease outbreak, the public health authority adhered to a one-way communication throughout the outbreak by sending a message that people should not be worried about MERS as long as preventive measures were well performed (Choi et al., 2015). In addition, the governmental aids for the victims (patients and those who were quarantined) was restricted to the financial compensation. The emotional supports for the victims were initiated by a group of healthcare professionals; however, the government was not able to provide the system for the effective delivery of the service. Furthermore, after the MERS outbreak, the government's effort for the recovery was highly biased on the economy. Meanwhile, the responsibility of recovering from emotional distress fell into the hands of those who were affected by the outbreak. As a result, there was a delay in the nation's emotional recovery from the MERS outbreak.

1.2. Research purposes

This dissertation attempts to reduce the gap between requirements and practices observed in providing emotional support during an outbreak where people suffer from intensive emotional distress they cannot process with usual tactics. Focusing on emotion as a key factor of enhancing the management of a disaster caused by an outbreak, this dissertation aims to produce the evidences on the emotions people experience during an outbreak and on the influences of those emotions, using multiple methods. Also, from the evidences, implications are be drawn to improve the management of a disaster caused by an outbreak. Lastly, the directions for future study are proposed. Two key groups of people, the hospital workers and the public, are focused for the purposes.

2. Literature review

2.1. Emotion as a product of cognitive appraisal

Emotion is "a psychological state or process that mediates our concerns (goals) and the events happening in our world" (Keltner, Oatley, & Jenkins, 2013, p. 4). This is why people feel fear (emotion) when they are almost hit by a car while crossing the road (an event in our world), and as a consequence, self-preservation (concerns/goals) is motivated. Also, in the process of motivating, people experience physiological (e.g., activation of the brain and the nervous system) and/or behavioral (e.g, facial and vocal expressions) changes as a result emotions. For some scholars, such changes play a central role to understand what emotion is, in that emotion is described as co-occurring feelings of the changes. For example, James (1890, p.449), who focused on the physiological changes caused by the emotion, asserted that "the bodily changes directly follow the perception of the existing fact and that our feeling of the same changes as they occur" was emotions.

Other scholars also understood the source of emotions was the events happening in our world, but more emphasized the psychological component between the events and the emotions—cognitive appraisal. According to the understandings of cognitive emotion theorists, how people appraise an event is accountable for emotions (Lazarus, 1991; Frijda, 1986; Roseman, 1984; Scherer, 2000; Smith & Ellsworth, 1985). For example, feeling of fear (emotion) when almost hit by a car while crossing the road (an event in our world) is because of people think of the event as a threat (cognitive

appraisal). Therefore, under the theory, emotion is conceptualized as a product of cognitive appraisal. Furthermore, each emotion is hypothesized to have an unique underlying cognitive structure corresponding to the appraisal that produces the emotion.

Lazarus (1991) referred this cognitive structure of emotions as “the core relational theme,” describing that each emotion had a distinctive relational meaning constructed during the appraisal process. For example, “a demeaning offense against me and mine” constructs the core relational meaning of anger. If a person appraises an event as such, anger is aroused to the person. Similarly, if a person appraises an event as “an uncertain and existential threat,” which is, the core relational theme of anxiety, anxiety is aroused. In other words, if a person appraises an event close enough to the core relational theme of a particular emotion, the emotion is aroused. Lazarus’ proposition on the core relational theme of various emotions are presented in Table 1. After the proposition, the relational themes of emotions have been explored and expanded[3].

3) In the case of anger, variant relational themes have been proposed. Similar to the relational theme of Lazaruss, the themes indicating the violation of the what the person count upon were proposed: "being slighted or hurt by the intentional acts of another person" (Frijda, 1986, p. 198) and "the blameworthiness of someone else's actions" (Ortony et al., 1988, p. 147). In extension of the object of the violation, “the violation of what ought to be” (i.e., standards) was also frequently used as a relational theme of anger (Frijda, 1986, pp. 198-199; Mascolo, Harkins, & Harakal, 2000, p. 137; Ortony et al., 1988, p. 152-153). In addition, focusing more on the to the idea of goal blockage, "the thwarting of goals" was proposed as well (Ortony et al., 1988).

Table 1. Emotions and core relational themes (from Lazarus, 2006)

Emotion	Core Relational Theme
Anger	A demeaning offense against me and mine
Anxiety	Facing an uncertain, existential threat
Fear[4)]	Confronting an immediate, concrete, and overwhelming physical danger
Surprise	Confronting an unexpected event
Guilt	Having transgressed a moral imperative
Shame	Having failed to live up to an ego ideal
Sadness	Having experienced an irrevocable loss
Envy	Wanting what someone else has and feeling deprived in its absence
Jealousy	Resenting a third party for a loss or threat to one's favor or love
Happiness	Making a reasonable progress toward the attainment of a goal
Pride	Enhancement of one's ego identity by taking credit for a valued achievement, one's own, or that of a person or group with which one identifies
Relief	A distressing goal−incongruent condition that has changed for the better or gone away
Hope	Fearing the worst but yearning for the better and believing that the wished−for improvement is possible
Love	Desiring or participating in affection usually, but not necessarily, reciprocated
Gratitude	Appreciation of an altruistic gift
Compassion	Being moved to offer help by another's suffering

4) "Fear" was originally labeled as "fright" which combines the meanings of "fear" and "surprise." However, the proposed core relational meaning of "fright" lacked the element of unexpectedness which was an important feature of "surprise"; thus, it was more suitable to be labeled as "fear" rather than "fright." "Surprise" is newly added to describe unexpectedness.

Frijda (1987) referred the cognitive structure that underlied each emotion as “appraisal profile.” The importance of Frijda’s work lies in its focus on the componential nature of the appraisal profile of emotions. In other words, the appraisal that characterizes emotions might be composed of the limited numbers of dimensions. Adopting the idea, efforts to identify the core dimensions of the appraisal which effectively differentiate emotions were followed by Frijda’s prioneering work.

One of the outcomes of such efforts were Smith and Ellsworth (1985) where six core dimensions were identified—pleasantness (how the situation is pleasant or enjoyable); anticipated effort (how much effort the situation requires); certainty (how certain about the happenings in the situation); attentional activity (how much attention is devoted to the situation); self-other responsibility (self/others are responsible for the situation); and control (situation/self/other is controlling the situation). Using the dimensions, various emotions were found efficiently differentiated. For example, using the pleasantness and self-other responsibility dimensions, happiness, pride, surprise were differentiated from frustration, fear, and anger (Figure 1.a). Also, by self-other responsibility and control dimensions, surprise, contempt, disgust, anger were differentiated from sadness and fear (Figure 1.b).

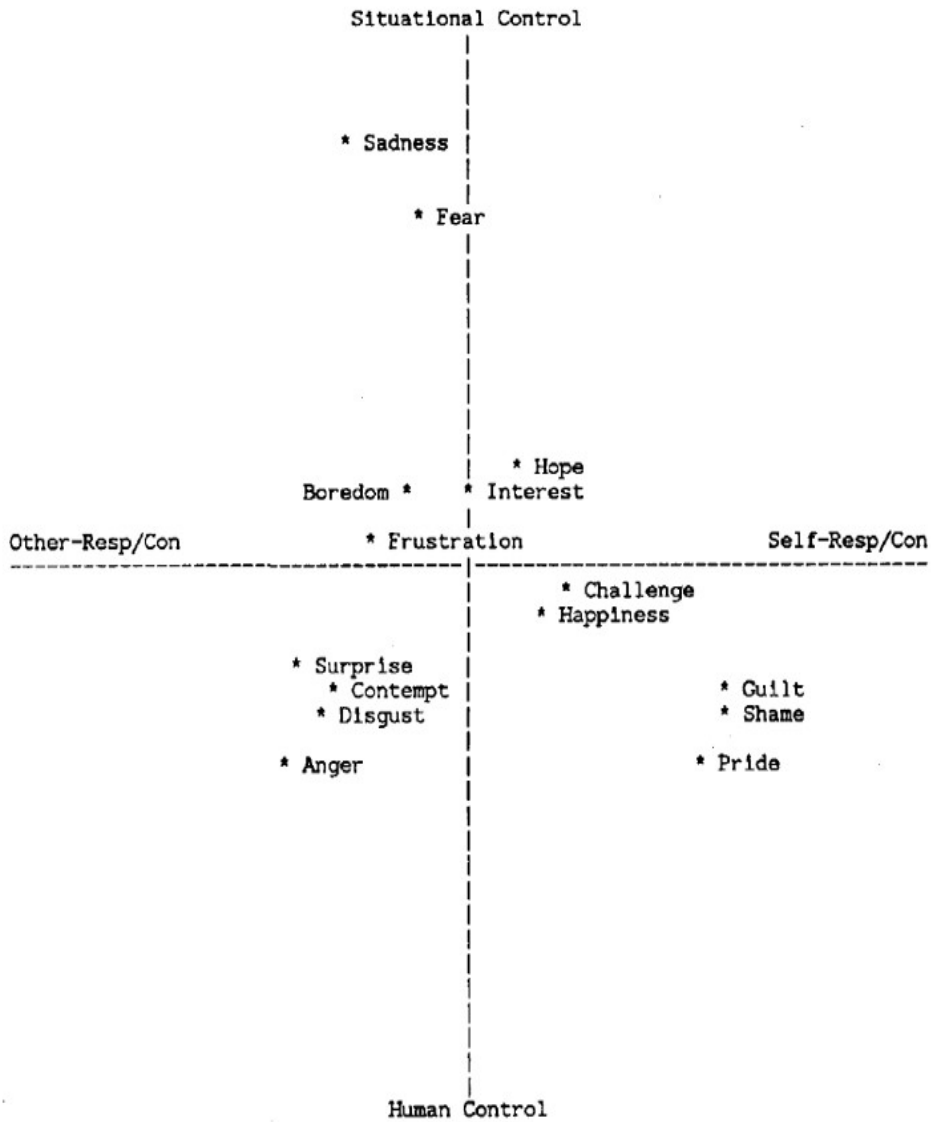

Figure 1.a. Location estimates of emotions by pleasant/unpleasant (x-axis) and high/low effort (y-axis)

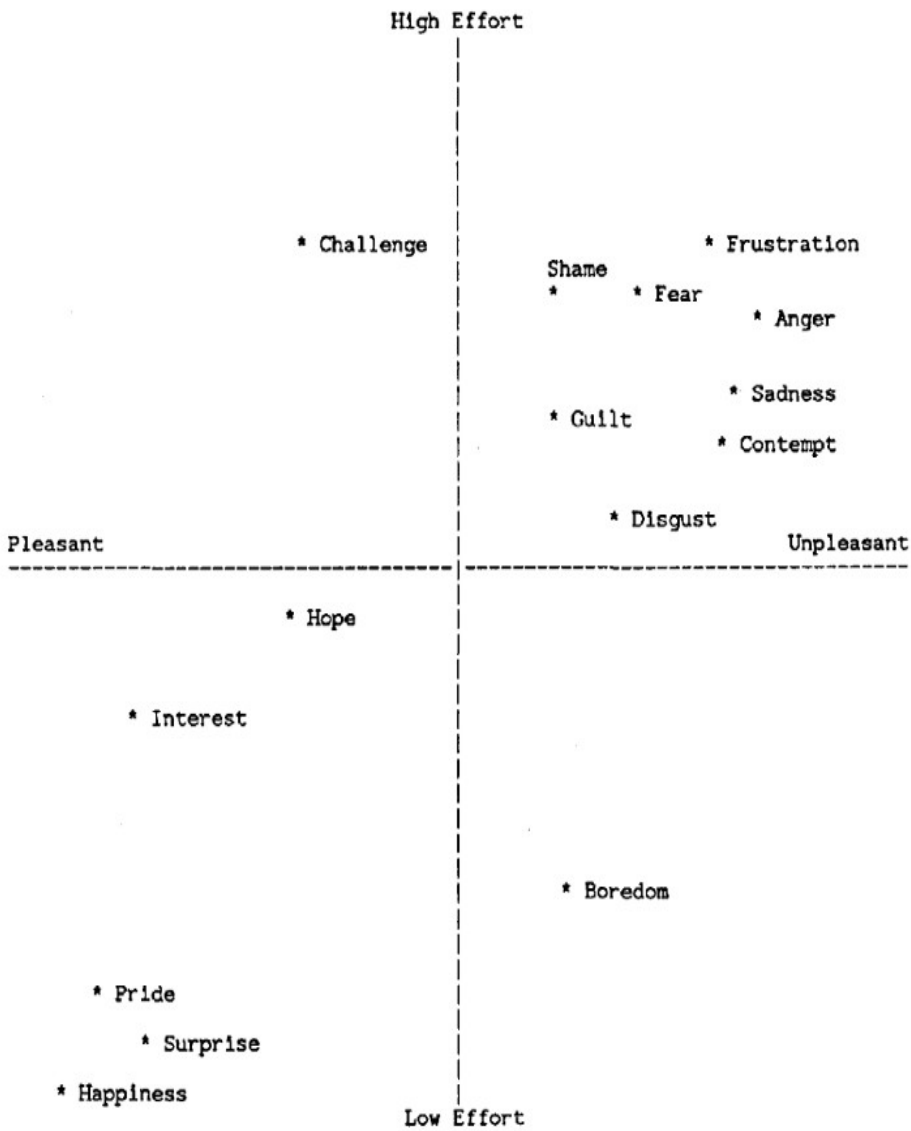

Figure 1.b. Location estimates of emotions by self-other responsibility (x-axis) and control (y-axis) dimensions

The profiled emotions by the core dimensions contributed to find the different cognitive structures among emotions that have been generally

considered in the same category of good–bad (i.e., the pleasantness dimension). For example, fear and anger are both unpleasant emotions. However, they are different for the four other dimensions—certainty, anticipated effort, control, and self–other responsibility. While anger is characterized by an appraisal of high certainty, medium anticipated effort, high self–control, and high self–other responsibility, fear, on the other hand, is by low certainty, medium attentional activity, high anticipated effort, low self–control, and medium self–other responsibility (Lerner & Keltner, 2000). Accordingly, anger is aroused from an appraisal of an event as certain, controllable, and caused by others, while fear is aroused from an appraisal of an event as uncertain, uncontrollable, and possibly caused by others.

2.2. Emotion as an influencer of cognitive judgment, social action, and functioning

The cognitive approach to emotion explains how emotions affect people to take a particular way of cognitive judgment, social action, and functioning. According to Lazarus (2006), when an emotion is aroused, the emotion process begins. In the process, the appraisal on what the environment demands takes place at an instant, which is signified by the relational meaning or the appraisal profile of the aroused emotion. Then, a person is motivated to respond to the environmental demand by adopting a particular way of cognitive appraisal and social behaviors, coordinated by the emotion.

Further, the way emotion motivates a particular way of appraising and behaving supports people in adapting to the environment. For this reason,

emotion is viewed as one of the adaptation resources to human being (Smith & Lazarus, 1990). Focusing on this particular aspect of emotion, the influence of emotions is also highlighted in the process of how people positively adapt to the substantially risky environment, and as a consequence, maintain their social functioning (Keltner & Haidt, 1999). Such effect of emotions on cognitive appraisal, social behaviors, and functioning is discussed as follows.

2.2.1. Emotion and cognitive appraisal

Under the cognitive emotion theory, each emotion is hypothesized to have a unique cognitive, and this results in a certain cognitive predisposition (or appraisal tendency) activated by emotion (Lerner & Keltner, 2001; Lerner & Tiedens, 2006). For example, anger has cognitive structure characterized by high predictability, high controllability by the self, and other responsibility. This leads to an optimistic view on the future events where negative events are perceived as predictive, under human control, and brought by others. In contrast, fear has cognitive structure characterized by low predictability and low controllability by the self. This leads to a pessimistic view where negative events are perceived as unpredictable and under situation control rather than human control (Lerner & Keltner, 2000) (Table 2).

Table 2. Emotions and appraisal tendency (modified from Lerner & Keltner, 2000)

	Anger	Fear
Cognitive structure		
Certainty	High	Low
Pleasantness	Low	Low
Attentional activity	Medium	Medium
Anticipated effort	Medium	High
Self control	High	Low
Other responsibility	High	Medium
Appraisal tendency	Perceive negative events as predictable, under human control, and brought about by others	Perceive negative events as unpredictable and under situational control

Also, the appraisal tendency activated by emotions predicts the effect of emotions on risk perception (Lerner & Keltner, 2000). That is, anger is associated with low risk perception because of the optimistic appraisal tendency; on the other hand, fear is associated with high risk perception because of the pessimistic appraisal tendency. The suggested effect of emotions on risk perception was verified in a national field experiment using the 911 attack in the United States (Lerner, Gonzalez, Small, & Fischhoff 2003; Small, Lerner, & Fischhoff, 2006). Specifically, those who felt fear perceived the risk of terrorism as higher than those who felt anger, resulting from the heightened risk perception by the emotion.

In addition to the role of discrete emotions, the negative and positive dimension of emotions have been investigated as well. Most prominently, theory of affect heuristic explains how people's judgment on risk and

benefit is consulted by the affective feeling (positive or negative) (Slovic, Finucane, Peters, & MacGregor, 2004). Specifically, the negative affect increases risk perception when the subject receives an information of high benefit and decreases benefit perception when a subject receives an information of low risk. On the contrary, the positive affect decreases risk perception when a subject receives an information of high benefit and increases benefit perception when a subject receives an information of low risk. Further, affect heuristic in judgment on risk and benefit can lead to actual behaviors, which is explained in the next section.

2.2.2. Emotion and social behaviors

Similar to emotion with a distinctive cognitive structure affects subsequent appraisal it also affects social behaviors by activating a particular tendency of action. The tendencies of action are "states of readiness to execute a given kind of action" (Frijda, 1987, p. 70) triggered by an emotion with a certain cognitive structure and function. According to the framework of action tendency, anger, of which the function is to control, activates an agonistic action tendency to remove risk. On the other hand, fear, of which the function is to protect, activates an avoidance tendency for the inaccessibility of risk. Anxiety, of which the function is to take caution, activates an inhibition for the absence of a response for risk factors (Steunebrink et al., 2009). (Table 3)

Table 3. Emotions and action tendency (modified from Steunebrink et al., 2009)

Emotion	Function	Action Tendency	Environmental Demands
Desire	Consume	Approach	Access
Joy	Readiness	Free activation	-
Anger	Control	Agonistic	Obstruction removed
Fear	Protection	Avoidance	Own inaccessibility
Interest	Orientation	Attending	Identification
Disgust	Protection	Rejecting	Object removed
Anxiety	Caution	Inhibition	Absence of a response
Contentment	Recuperation	Inactivity	-

This relationship between action tendency of emotions and actual behaviors was empirically tested using the natural disaster scenario (Xie, Zhang, Li, & Yu, 2010). Four operationalized categories of emotions were used based on their cognitive structures: ethical emotions (intense emotions such as fury, indignation, anger, and contempt), loss-based prospective emotions (disturbed emotions such as fear, worry, helplessness, and troubled feelings), positive valence (pride, admiration, envy, and relief), and loss-based retrospective emotions (the experience of victims such as sympathy, regret, and hope). The result confirmed the action tendency of emotion as the relationships of ethical emotions to aggression/retaliation, two loss-based emotions to help/prevention, and the loss-based prospective to escape/avoidance have been presented.

Research focusing on a specific emotion and exploring its influence on either of avoidance or approach behaviors to risks were followed as well.

For example, the fear appeal explains fear motivates people to avoid risks and adopt healthy behaviors (Witte & Allen, 2001). Other research focused on anger; for example, the Anger Activism Model (AAM) explains the relationship between anger and approach behaviors. An experiment based on the model revealed that anger contributes to the development of an activist public who have a positive attitude about issues and are willing to engage in behaviors to change the adverse situation (Turner, 2007). Ferrer, Maclay, Livak, and Lerner (2017) also investigated the effect of anger in a risky situation. An experiment to examine whether anger increases risk–taking behaviors (approach) more compared to neutral emotions was conducted. The result confirmed that risk–taking behaviors were more affected by anger.

With regards to the negative and positive dimension of emotions, affect heuristic in judgment on risk and benefit can also lead to actual behaviors. As mentioned, negative affect is associated with increased risk perception and decreased benefit perception. This causes the actual rejection of the object of judgment (avoidance). Similarly, the positive affect, which is associated with decreased risk perception and increased benefit perception, causes the adoption of the object (approach) (Finucane, Alhakami, Slovic, & Johnson, 2000).

2.2.3. Emotion and social functioning

Emotion motivates a particular way of appraise and behaving in a way to promote one's positive adaptation and maintenance of social functioning even when faced with environmental adversity (Darwin, 1987; Ekman, 1993; Keltner & Haidt, 1999). Such relationship of emotions and the maintenance

of social functioning was described by a couple of models. The emotion process model of Lazarus (2006) provided a comprehensive view on stressors or risks in the environment, appraisal activity, emotion arousal, coping activity, maintenance of functioning, and personal and situational conditions. According to the model, the appraisal of a stressor in its core relational meaning resulted in emotional responses, and to process emotions, in other words, to respond to the demands of the environment where the stressor was embedded, coping took place. The positive outcomes of social functioning—for example indicated by mental health and performance—were viewed to be lead by the adequacy of coping. In addition, the model also described how the emotion process could be influenced by the personal situational conditions where people accessed and used the necessary resources for processing.

The resilience model of Richardson (2002) explained the process of the disruption of homeostasis by stressors and reintegration. As the model focused on the different types of reintegration, the activity of appraisal and coping was not explicitly described. In the model, emotions—such as hurting, loss, guilt, fear, confusion, and bewilderment—were described to result in disruption when stressors occurred (or, in Lazarus' way of explanation, when the stressors were perceived and appraised). The protective factors buffering the degree of disruption were involved in the model (in the process of Lazarus [2006], the factors that correspond to resourceful personal and situational conditions). The interaction between stressors and protective factors was viewed to determine the degree of disruption; however, the interaction as well as the extensive process to each type of reintegration

were not fully elaborated. Instead, as the outcome of the process, four types of reintegration were proposed—resilient reintegration, reintegration back to homeostasis, reintegration with loss, and dysfunctional reintegration—representing different levels of maintenance or even improvement of social functioning after going through a difficulty.

From both models, the process of emotions aroused from the stressors or appraisal of stressors was regarded as an important part of maintaining social functioning even in an adverse situation. Recently, many studies that investigate the maintenance of the social functioning of people in high stress situations consider the experience of emotions. For example, Galatzer-Levy, Metzler, and Neylan (2013) used the positive and negative dimension of the emotions that police officers in high risk environment experienced for the purpose to predict the maintenance of low psychological symptoms overtime. The result found that low negative emotions predicted constant low psychological symptoms. Based on the result, the study suggested the role of emotion as "a key theoretical candidate" in understanding the level of healthy adaptation at risk.

2.3. Emotions of the hospital workers and the public during an infectious disease outbreak

2.3.1. Hospital workers

Hospital workers deliver "lifeline" services in response to an infectious disease outbreak and, in turn, reduce impacts of an outbreak on the community. For this reason, their ability to perform at their highest

professional capacity is highly related to a successful response to disease outbreaks. The World Health Organization's Regional Office for Europe report proposed a well−performing health workforce as one of the elements to effectively prepare for and manage a disaster, describing it as one "who works in ways that are responsive, fair, and efficient to achieve the best health outcomes possible, given the available resources and circumstances." The importance of providing them proper training and education was followed in the report and was also emphasized in many other literature about the management of a disaster caused by an infectious disease outbreak.

Although hospital workers are usually expected to be curers who have proper knowledge and skills during an infectious disease outbreak, and to be accountable and responsible to protect the public, as individuals, they are especially vulnerable as they are more closely and frequently exposed to disease risks (Chong et al., 2004). For this reason, hospital workers are regarded as a high risk group of prolonged emotional distress in an outbreak along with the directly affected victims (Jeong, 2017). When hospital workers are under the influence of the overwhelming emotional distress, they could merely, and mostly poorly react to the situation (Mitroff, 2005), consequently undermines their functions as health professionals in a disease outbreak. With the understanding, literature that includes the description, influential factors, and the effects of hospital workers' stress and emotions were reviewed.

The review found consistent evidences of high risk of stress among hospital workers affected by the SARS outbreak. For exmaple, Chan et al.

(2015), by investigating Taiwanese hospital workers (n=1,470), found even in low risk group, at least 68.3% of the them always/often experienced stress during the outbreak (Chan et al., 2005). Another study which investigated Taiwanese participants (n=92) similarly found almost half of the high risk participants considered the outbreak as a source of very serious/serious stress (Lin et al., 2007). Studies with samples from other nationalities generally presented similar results and conclusions (Maunder et al., 2004; Maunder et al., 2006; McAlonan et al., 2007). Such experience of high stress was found to be influenced by close contact with the SARS patients (Chan et al., 2005; McAlonan et al., 2007). As a result of high stress, the practice of preventive measures after work (Chan et al., 2005), as well as physical and mental health both in the short term (Chan et al., 2005) and the long term (Maunder et al., 2006; McAlonan et al., 2007) decreased.

Negative emotions were also extensively experienced during the SARS outbreak. Chong et al. (2004) reported more than 70% of the participated Taiwanese hospital workers (n=1,257) felt anxiety and/or depression during the outbreak. Among Canadian hospital workers (n=184) fatigue was experienced by 70.3%, worry by 57.3%, fear by 41.7% of high risk participants (McAlonan et al., 2007). Another study investigating Canadian participants (n=510), 24.0% and 29.2% were very to extremely concerned about health of the self and the family, respectively, and 29.0% was found a probable case of emotional distress (Nickell et al., 2004). Other studies, while some of which did not report statistical values, reported negative emotions experienced by hospital workers during the outbreak as well: fear,

anger, anxiety, depression, frustration, dissatisfaction, doubt, feelings of extreme vulnerability, helplessness, loss of control, emotional exhaustion (Chong et al., 2004; Fiksenbaum et al., 2006; Lehmann et al. (2015); Maunder et al. 2003; 2004).

Among those emotions, fear, worry, fatigue, dissatisfaction was induced specifically by high possibility to become infected (Maunder et al., 2003; 2004; McAlonan et al., 2007). Nickell et al. (2004) examined multidimensional influential factors of emotions and found anxiety was influenced by high risk perception, belief in preventive measures, personal/family lifestyle affected, being treated differently induced anxiety, while emotional distress was influenced by lifestyle affected and ability to do one's job affected by the precautionary measures. Fiksenbaum et al. (2006) found emotional exhaustion and anger was influenced by a high risk perception of SARS and a low organizational support. Although the affected emotions were unspecified role conflict between healthcare providers and parents were also reported as possible influencers of emotions (Maunder et al., 2003). With regard to the effects of emotions, fear was reported to decrease mental health of hospital workers (i.e., the likelihood of PTSD) (Maunder et al., 2004). (Table 4).

Table 4. Studies of emotions of hospital workers in an infectious disease outbreak

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognitive Appraisal/Social Action/ Functioning)
Chan et al., 2005	SARS	1,470 nurses in Hong Kong	Stress (SARS NSQ) - High risk group (SARS ward/SARS ICU): 74.0% always/often felt stress - Medium risk group (non-SARS ward, some contact with SARS patients): 80.1% always/often felt stress - Low risk group (non-SARS ward, no contact with SARS patients): 68.3% always/often felt stress	High level of contact with SARS patients increased stress (statistics NR)	Stress decreased the perceived physical health and the practice of preventive measures after work (*OR*=1.42, 95% CI [1.02, 1.98])
Chong et	SARS	1,257	• Anxiety (CHQ):	—	—

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognitive Appraisal/Social Action/ Functioning)
al., 2004		health workers in Taiwan	77.4% felt anxiety and worry • Depression (CHQ): 74.2% felt depression (and poor family relationships) • Feelings of extreme vulnerability, helplessness and loss of control (reported in the debriefing session)		
Fiksenbaum et al., 2006	SARS	333 nurses in Canada	• Emotional exhaustion (MBI-GS): High level (statistics NR) • Anger (STAXI): High level (statistics NR)	• High perception of SARS threat (standardized path coefficient=0.44) and low organizational support (standardized path coefficient=0.11) raised emotional distress	–

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognitive Appraisal/Social Action/ Functioning)
				• High perception of SARS threat (standardized path coefficient=0.41) and low organizational support (standardized path coefficient=0.26) raised anger	
Lehmann et al., 2015	Ebola	70 healthcare professionals	• Anxiety (GAD-7): - High risk group (direct contact with patients): 2.43(*SD*=2.7) - Control group: 2.41(*SD*=2.0) • Depression (PHQ-9) - High risk group: 3.52(*SD*=3.3) - Control group: 3.38(*SD*=3.0)	—	—
Lin et al.,	SARS	9 2	Stress (a single	The risk level of the	—

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognitive Appraisal/Social Action/ Functioning)
2007		healthcare workers in Taiwan	categorial scale) - High risk group (emergency department): 48.5% considered SARS as a very serious/serious stress - Medium-risk group (psychiatric ward): 34.6% considered SARS as a very serious/serious stress	working condition did not cause a difference in stress	
Maunder et al., 2003	SARS	Nine core members of a hospital and mental health care providers in Canada	Fear, anxiety, anger, and frustration (reported in an unstructured interview)	Possible contagion, infecting close ones influenced fear, role conflict between healthcare providers and parents (reported in an unstructured interview, the affected emotion unspecified)	—

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognitive Appraisal/Social Action/ Functioning)
Maunder et al., 2004	SARS	1,557 hospital workers in Canada	• Fear for health (11 items, scale NR) - Nurse with contact with SARS patients (G1): 4.25(*SD*=1.08) - Nurse without contact(G2): 3.54(*SD*=1.27) - Non-nurse with contact(G3): 3.68(*SD*=1.14) - Non-nurse without contact(G4): 2.96(*SD*=1.21) • Doubt - G1: 2.23(*SD*=0.73) - G2: 2.43(*SD*=0.85) - G3: 2.19(*SD*=0.79) - G4: 2.44(*SD*=0.91) • Dissatisfaction - G1: 2.75(*SD*=0.98)	Between-group difference by contact with SARS patients was significant	• Fear for health increased the likelihood of PTSD (regression coefficient: 0.205, $p<0.001$) • Stress from the job increased the likelihood of PTSD (regression coefficient: 0.208, $p<0.001$) • Doubt and dissatisfaction did not increase the likelihood of PTSD

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognitive Appraisal/Social Action/ Functioning)
			- G2: 2.24(*SD*=0.87) - G3: 2.46(*SD*=0.88) - G4: 2.31(*SD*=0.82) • Stress - G1: 4.26(*SD*=0.98) - G2: 3.88(*SD*=1.18) - G3: 4.06(*SD*=1.13) - G4: 3.51(*SD*=1.22)		
Maunder et al., 2006	SARS	187 hospital workers in Canada	Stress (Five items, 6-point-scale) - Statistics NR	—	Stress was correlated with burnout (Spearman ρ=0.312, p<0.001) and psychological distress (Spearman ρ=0.224, p=0.008) after one year
McAlonan et al., 2007	SARS	184 hospital workers in Canada	• Stress (PSS-10) - High risk group (respiratory medicine department): 17.0(*SD*=5.7) - Low risk group non-respiratory	High risk of the working environment increased fatigue (χ^2=37.9, p<0.05), worry (χ^2=4.1, p<0.05) and fear (χ^2=5.8, p<0.05)	

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognitive Appraisal/Social Action/ Functioning)
			medicine department): 15.9(*SD*=4.7) • Fatigue - High risk group: 70.3% - Low risk group: 22.1% • Worry about health - High risk group: 57.3% - Low risk group: 41.2% • Fear of social contact - How risk group: 41.7% - Low risk group: 23.5%	not stress	
Nickell et al, 2004	SARS	510 hospital workers in Canada	• Worry (Two categorial items): 24.0% and 29.2% were very/ extremely	• Perceived death rate of SARS (*OR*=1.6, 95% CI [1.8, 2.1]), personal/family	—

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognitive Appraisal/Social Action/ Functioning)
			concerned about health of the self and the family, respectively • Emotional distress (GHQ-12): 29.0% was found a probable case of emotional distress	lifestyle affected (*OR*=3.3, 95% CI [2.5, 4.3]) , being treated differently (*OR*=1.6, 95% CI [1.2, 2.1]) raised concern • Personal/family's lifestyle affected (*OR*:=2.2, 95% CI [1.4, 3.5]) raised emotional distress	

Note. CHQ: Chinese Health Questionnaire, DASS: Depression Anxiety, GAD: Generalized Anxiety Disorder Scale, GHQ: General Health Questionnaire, MBI-GS: Maslach Burnout Inventory-General Survey, NSQ: Nurses' Survey Questionnaire, PHQ: Patient Health Questionnaire, SARS: Severe Acute Respiratory Syndrome, PSS: Perceived Stress Scale, STAXI: State-Trait Anger Expression Inventory;
PTSD: Post-traumatic stress disorder;
CI: Confidence interval, *OR*: Odds ratio, *SD*: Standard deviation;
NR: Not reported

2.3.2. The public

While the hospital workers are viewed as curers, the public are generally viewed as potential victims in disasters. For this reason, in general, the public's emotional disruption acquire legitimacy more easily in an infectious disease outbreak compared to that of the hospital workers. However, in another aspect, the public should take responsibility for the disease response when vaccination and/or treatment is absent or quantity is insufficient. In the CDC report for responding to influenza, three primary strategies are identified: vaccination, the treatment of infected individuals, and the implementation of infection control and social distancing measures (CDC, 2007). Without the availability of the former two, disease response relies on the third one, which typically refers to public health measures. For this reason, in investigation of the public's emotions during an outbreak, how the emotions are related to adherence to public health measures was also a major concern as well as what emotions are prominently presented. With the understanding, the literature that includes the description, influential factors, and the effects of the public's emotions were reviewed.

Emotions of the publics during an infectious disease outbreak have been investigated in more diverse outbreak cases—SARS, H1N1, and MERS. During the SARS outbreak, similar to hospital workers, the public also extensively felt negative emotions. Lau, Yang, Tsui, and Kim (2003) monitored the Hong Kong community's responses to SARS (n=1,297; 10 rounds) and found mean percentages of 33.6% and 48.4% of the participants felt worry and fear, respectively.

Similar results were found in regard to the H1N1 outbreak. Bults et al.

(2011) reported 36% and 16% felt a high level of worry (worried / very worried) and fear (scared / very scared) respectively among 456 Dutch participants in the first round survey. Likewise, in an investigation of 377 United Kingdom participants, it was reported that 23.8% experienced a high level of anxiety (Rubin, Amlôt, Page, & Wessely 2009). Studies investigating Asian participants reported relatively small portions of study populations felt negative emotions. For example, Lau, Griffiths, Choi, and Tsui (2010) found 15.8% has felt worry among 999 Hong Kong participants. Emotional distress (feeling panicky, depressed, and disturbed) was experienced by 6.0% of the participants in the same study. Also, in Liao, Cowling, Lam, Ng, & Fielding (2010) (1,001 Hong Kong participants), where anxiety was measured by a 5−point scale, the mean score was found 1.54 (SD = 0.86).

During the MERS outbreak, negative emotions were extensively experienced by South Korean population Lee, Kim, and Kang (2016) reported more than 80% of participants (n=450) felt fear for self and family, and also, almost half felt emotional distress such as moodiness, frustration, anxiety, and depression. Ro, Lee, Kang, and Jung (2017), where worry was measured with a scale, reported a mean worry score of 2.44. This was higher than the score of Hong Kong population experienced SARS outbreak reported in Liao et al. (2010).

While most of studies conducted a survey on the public's emotions during an infectious disease outbreak, a few studies made novel approach to investigate the MERS case by analyzing the public's SNS comments. Do, Lim, Kim, & Choi (2016) examined 145,098 comments, and found that fear

and anger were dominant during the outbreak. Song, Song, Seo, Jin, & Kim (2017) categorized emotions according to valence (negative/positive) and found negative emotions were expressed in 80.2% of the comments related to the MERS outbreak.

Such negative emotions experienced by the public during an outbreak were influenced by various factors. During the H1N1 outbreak, anxiety/worry was affected by the perceptions of high personal susceptibility and chance of contracting the disease, severe irreversibility of bodily damage, and high credibility on informal information raised anxiety/worry (Lau et al., 2010; Liao et al., 2010). In addition, the perception of high chance of family's contracting the disease raised emotional distress (Lau et al., 2010). During the MERS outbreak, high appraisal of non-dailiness and low self-controllability raised fear and emotional distress (Lee et al., 2016). Fear was also aroused by low credibility on the media and the government (Lee et al., 2016), as well as the disease threat (Do et al., 2016). Further, high perception on the mismanagement of the government induced anger (Do et al. 2016).

Importantly, those induced emotions functioned as "a positive dose-response gradient" (Leung, Quah, Ho, Ho, Hedley, Lee, & Lam, 2004, p.1037) of the adoption of preventive/protective/precautionary measures as they were consistently found to increase the adoption of preventive measures of the public in various infectious disease outbreaks (Bults et al., 2011; Lau et al., 2003; Lau et al., 2010; Leung et al., 2004; Liao et al., 2010; Rubin et al., 2009).

Table 5. Studies of emotions of the public in an infectious disease outbreak

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognition Appraisal/Social Action/Functioning)
Bults et al., 2011	H1N1	456-934 adults in the Netherlands	• Anxiety: 14%-36% felt worried/very worried (mean score 4+) (measured 3 times, 3 items, 5-point-scale) • Fear: 4%-16% felt scared/very scared (score 4+) (measured 3 times, 1 item, 5-point-scale)	–	High anxiety increased the intention to comply with government advised preventive measures in the future (*OR*=2.22; 95% CI [1.44, 3.42]) (3rd round)
Do et al., 2016	MERS	145,098 SNS comments	• Neutral comments: 83% • Emotional comments: 17% - Anger (31%), fear (30%), sadness (12%), disgust (11%), surprise (8%), happiness (8%)	• MERS threat raised fear (values, NR) • Mismanagement of the government raised anger (values, NR)	–

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognition Appraisal/Social Action/Functioning)
Lau et al., 2003	SARS	1,398 adults in Hong Kong	• Anxiety: 33.6% felt worried/very worried (measurement NR) • Fear: 48.4% felt scared/very scared (measurement NR)	—	High anxiety increased washing hands (*OR*= 2.270, 95% CI [1.212, 4.253])
Lau et al., 2010	H1N1	999 adults in Hong Kong	• Anxiety: 15.8% (2 items, Y/N) • Emotional distress (feeling panicky, depressed, disturbed): 6.0% (3 items, Y/N)	• Perception of a high chance of contracting H1N1 (*OR*=3.31, 95% CI [2.02, 5.42]), perception of severe irreversible bodily damage (*OR*=0.95, 95% CI [1.30, 2.90]) raised anxiety • Perception of high chance of family's contracting H1N1 raised emotional distress (*OR*=3.68, 95% CI [1.86, 7.29])	• High anxiety increased avoiding crowded places (*OR*= 1.62, 95% CI [1.07, 2.47]) and avoiding hospitals (*OR*=1.74, 95% CI [1.16-2.61]) • High emotional distress increased avoiding going out (*OR*=3.04, 95% CI [1.42, 6.48])

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognition Appraisal/Social Action/Functioning)
Lee et al., 2016	MERS	450 adults in South Korea	• Fear for self: 80.2%, fear for family: 88.4% (1 item per each, 5-point-scale, score 4,5 were regarded experienced) • Emotional distress: 46% (1 item per each, 5-point-scale, score 4,5 were regarded experienced)	• High appraisal on non-dailiness (*OR*= 2.7, 95% CI [1.0, 7.3; *OR*=8.1, 95% CI [2.9, 22.7], segregate results of 2 items reported), low credibility on the media (*OR*=3.5, 95% CI [1.4, 8.6]), low credibility on the government (*OR*=4.9, 95% CI [1.1, 21.0]), low self-controllability (*OR*=5.1, 95% CI [2.3, 11.6]) raised fear for self • High appraisal on non-dailiness (*OR*=3.8, 95% CI [1.7, 8.1]) and low self-controllability	

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognition Appraisal/Social Action/Functioning)
				(*OR*=4.3, 95% CI [2.3, 8.1]) raised emotional distress	
Leung et al., 2004	SARS	705 and 1,201 adults in Hong Kong and Singapore, respectively	Anxiety (STAI 10 item scale) - Hong Kong participants: 2.06(CI: 2.03-2.10) - Singapore participants: 1.77(CI: 1.74-1.79)	—	Higher anxiety increased washing hands in participants in Hong Kong - Medium anxiety (score 2-2.49) (*OR*=1.28, 95 CI [0.86, 1.92]) - High anxiety: (score 2.50-4) (*OR*=2.24, 95% CI [1.27, 3.97])
Liao et al., 2010	H1N1	1,001 adults in Hong Kong	Worry (1 item, 5-point-scale): 1.54(SD=0.86)	Perception of high personal susceptibility increased worry (standardized path coefficient=0.44)	High worry increased hand hygiene (standardized path coefficient=0.13), and social distancing (standardized path coefficient=0.36)

Author, Year	Infectious Disease	Participants	Emotion/Stress Experience	Precedence Factors (Stressor/Appraisal of Stressors)	Effect of Emotion (Cognition Appraisal/Social Action/Functioning)
Ro et al., 2017	MERS	1,000 adults in South Korea	Worry (1 item, 5-point-scale): 2.44(SD, not reported)	−	−
Rubin et al., 2009	H1N1	377 adults in the United Kingdom	Anxiety (STAI 10 item scale): 23.8% felt high anxiety (score 12+)	−	High anxiety increased the performance of the recommended behaviors (mean difference=1.7, 95% CI [1.3, 2.1]) and avoidance behaviors (mean difference=2.6, 95% CI [1.7, 3.5])
Song et al., 2017	MERS	791,858 SNS comments	• Negative emotion: 80.2% • Positive emotion: 19.8%		−

Note. H1N1: Novel Swine-origin Influenza A, MERS: Middle East Respiratory Syndrome, SARS: Severe Acute Respiratory Syndrome; SNS: Social networking site; STAI: State-Trait Anxiety Inventory;
CI: Confidence interval, *OR*: Odds ratio, *SD*: Standard deviation;
NR: Not reported, Y/N: Yes/No

2.4. Implications of literature review

From the literature review on the emotional experience of hospital workers during an infectious disease outbreak, it was revealed that the hospital workers suffered from high stress and negative emotions. Stressors such as high risk working condition and the appraisal of the stressors such as high risk perception on the diseases were also identified as related to those emotions and stress. Furthermore, the possibility of such negative emotions undermined hospital workers' social functioning with regard to their psychological health in particular was confirmed. This increased the necessity of addressing their emotional experience in human resource management in preparing and responding an infectious disease outbreak.

With regards to the public's emotions during an infectious disease outbreak, literature review found the public suffer from negative emotions as well. How they appraise the stressors of the situation, for example, high risk perception on the disease were also identified to be related to those emotions. Also, the majority of the studies found the experience of negative emotions increased protective behaviors of the public such as washing hands and avoiding crowded places.

Nevertheless, there were limitations to the previous studies. In the studies of hospital worker's emotions, above all, the effect of emotions on the social functioning was examined without theoretical consideration. It would be beneficial to investigate the effect of emotions adopting theoretical models, that explain the process of how social functioning is maintained at risk. Therefore, this dissertation attempts to investigate emotions of hospital workers and the effect emotions on the process of their positive adaption

and maintenance of functioning in a disease outbreak, using theoretical models and structural equations modeling (SEM) (Study 1).

Another limitation is that the majority of literature focused their investigations on several emotions and stress. This is presumably because the studies mostly have used the survey method where a few emotions should be selected. Studies that used the interview method (Maunder et al., 2003; Chong et al., 2004) reported emotions with more varieties. A narrow focus on several emotions possibly limits identification of the stressors that trigger the negative emotions during an outbreak which should be reduced or removed by management. As noticed in Maunder et al. (2003), where the interview method was adopted, an extensive exploration of emotions leads to the identification of more various stressors that should be mitigated. For this reason, this dissertation uses a qualitative approach to explore hospital workers' diverse emotions and also the stressors which trigger those emotions during an outbreak (Study 2).

The studies of the public's emotions also focused on a few emotions; however, more importantly, in examining the effect of emotions on behaviors, heterogeneous activities were included under the labels such as preventive, protective, or precautionary behaviors. Some of those are eligible behaviors acknowledged by public health authorities but others are not. For example, the effect of disease prevention of washing hands and wearing masks were scientifically proven and recommended (CDC, 2007). On the other hand, avoiding hospital workers and their families is discrimination, which aggravates stress and emotional disruption of hospital workers during an outbreak (Schulze & Wansink, 2012). Rubin et al. (2009) attempted to

divide behaviors into “recommended” and “not recommended.” However, for more effective examination of the effect of emotions on behaviors, tthere should be theory–based ways of classifying behaviors. Considering this, this dissertation lists various kinds of protective behaviors often adopted by the public during an outbreak and classifies them based on theoretical frameworks.

Furthermore, the effect of emotions are examined in the perception of the public after an outbreak as well as the behaviors during an outbreak, which has not been considered in previous studies. Additionally, anger, also rarely investigated previously, is introduced, which has benefits in defining the different effects of emotions on perception and behaviors when compared with emotions like fear and anxiety (Study 3).

3. Composition of the dissertation

This dissertation is motivated by the gap between the necessity of an active and systematic emotional support in an infectious disease outbreak and the negligence of emotions in the practice. In order to address emotions in the management of a disaster caused by an outbreak, it should be precedent to understand what emotions and emotional experience of people in an outbreak are, what induces such emotions, and how the emotions affect subsequent responses. However, so far, such are underexplored and currently available evidences provided by previous studies are limited, in that they stay focused on several emotions and examines the effect of the emotions without theoretical consideration.

With the purposes to produce evidences on emotions, the influencers of emotions, and the effects of emotions with regard to an outbreak situation, and thus, to provide implications on disaster management, three studies are designed. Various methods are adopted for the investigations and two key groups of people, hospital workers and the public, are focused. Study 1 and Study 2 consider the hospital workers, and Study 3 considers the public.

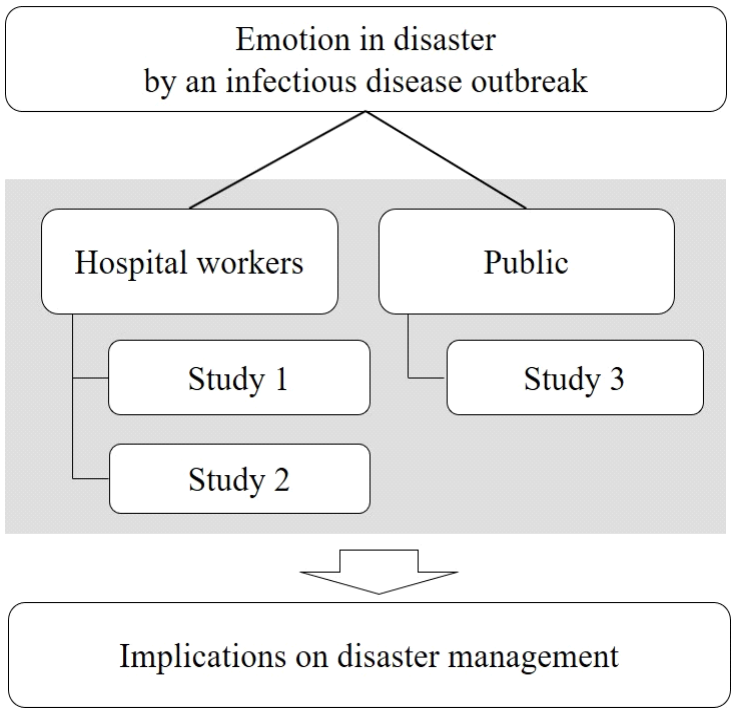

Figure 2. Construction of the dissertation

Specifically, Study 1, using a quantitative approach, investigates the negative emotions of hospital workers and the effect of those emotions on their social functioning after an outbreak. For the investigation, the concept of resilience and the models that explain the process of resilience were adopted. The construction of negative emotions is examined in how the emotions are affected by hospital workers' appraisal of disease threat.

Study 2 further investigates the emotions of the hospital workers during an outbreak. In the study, the discrete emotions of hospital workers and stressors that trigger those emotion are explored. For the extensive exploration, a qualitative approach is adopted.

Study 3, using a quantitative approach, investigates emotions of the public

and the effect of those emotions on the risk perception after an outbreak as well as the protective behaviors during the outbreak. The discrete emotions (fear, anger, and anxiety) are used, and how they differently affect the public's behaviors and risk perception is examined based on psychological frameworks. The construction of emotions are examined in how the emotions are affected by the public's appraisal of non-dailiness, considering that disruption of daily routines caused by an outbreak is known to be especially stressful for the general public under indirect influence (Lee et al., 2016).

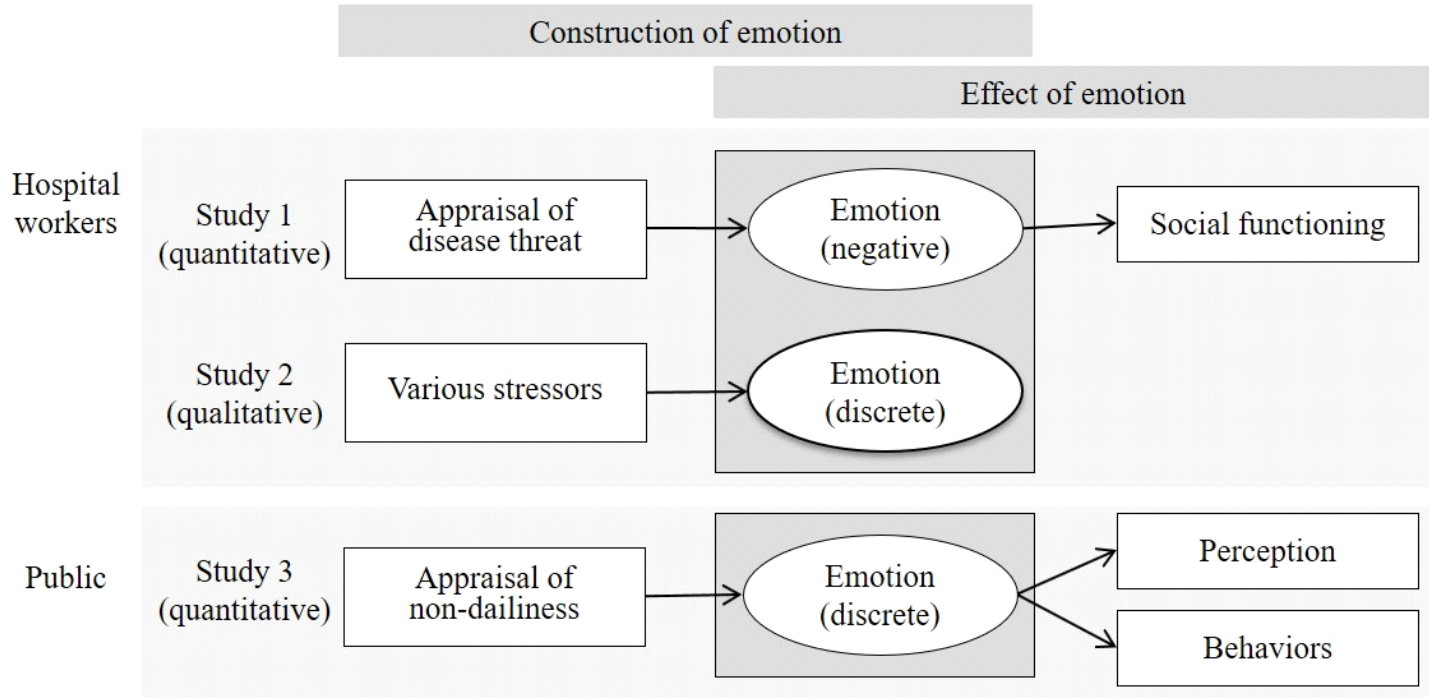

Figure 3. Composition of the studies

4. Study 1

4.1. Research Question

In Study 1, emotions of hospital workers in an infectious disease outbreak and the effect of the emotions on their resilience after an outbreak were investigated. In particular, the effect was examined in relation with the appraisal of risk and personal resource to explain resilience. Furthermore, whether emotions and the effect of the emotions were different by occupation was examined as well. Here, healthcare workers (clinical staff) and non-healthcare (clinical technical/support staff and non-clinical staff) workers were compared. This was because the professional role of healthcare workers and non-healthcare workers were different in an outbreak, therefore, the overall experience including emotional experience was likely to differ from each other. Accordingly, the sub-research questions are as followed: (1) how does negative emotions affect hospital worker's resilience after an outbreak? (RQ1), and (2) how do negative emotions and the effect of the differ by occupation? (RQ2).

4.2. Review of key concepts for modeling

4.2.1. Key concepts

4.2.1.1. Resilience as demonstration of positive adaptation

Over the past two decades, resilience has become a popular research topic, with the focus having shifted from individuals' weakness to strength (Richardson, 2002). Now, it is expanding its implication on the policy and practice in various contexts related to the enhancement of health, well-being,

and quality of life (Windle, 2011). Human resource management is one of the areas where resilience is newly applied with the interest of employee resilience after organizational crises. The resilience of hospital workers—mostly nurses—has been investigated in this area, with a focus on the chronic problems of stress, high turnover rate, and shortage (Grafon, Gillespie, & Henderson, 2010; Hart, Brannan, & Chesnay, 2014).

Accompanied by the expansion of applicability, there has been confusion in understanding resilience due to its diverse definitions and concepts among research areas and scholars As an effort to reduce the confusion, Luthar and colleagues (Luthar, 2006; Luthar & Cicchetti, 2000) identified underpinning two core concepts across the various definitions of resilience, which are, the presence of risk and observation of positive adaptation. Nevertheless, discrepancies among researchers remain with regard to the specific delineation of the two aforementioned components.

The most prominent discrepancy is resilience as personal qualities that enables positive adaptation in the risk versus the demonstration of positive adaptation (Brit, Shen, Sinclair, Grossman, & Klieger, 2016). The former focuses on the individual's qualities to identify and utilize resources and, typically, the factors of individual, family, community, and organization associated with the increase of the likelihood of an individual showing positive adaptation (trait resilience) (Bonanno, 2004; Lee & Cranford, 2008, Masten & Narayan, 2012). The latter highlights the presentation of the signs of positive adaptation as a result of successful identification and utilization of the resources (outcome resilience) (Britt, Sinclair,& McFadden, 2013; Cowden & Meyer-Weitz, 2016).

In this study, the view of resilience as demonstration of positive adaptation (outcome resilience) was adopted and referred as resilience. Two variables as the indicator of resilience were utilized, while trait resilience was considered as personal resource. To specify the indicators of resilience of hospital workers after an outbreak, a previous recommendation in selecting resilience outcomes that correspond well to the risk in concern was taken into consideration (Luthar, Cicchetti, & Becker, 2000). If the risk was an acute traumatic event rather than a chronic stress, it was recommended to use the indicators that represented the absence of psychiatric impairment due to the trauma. Also, previous studies on the effects of an outbreak on hospital workers reported that substantial numbers of the workers were at risk of psychiatric morbidity after an outbreak (Chong et al., 2004; Maunder, 2004; Maunder et al., 2006 etc.). Therefore, the likelihood of post–traumatic syndrome disorder (PTSD) was used as an indicator of resilience in this study.

For hospital workers, an infectious disease outbreak is a work–related trauma. job or duty abandonment is another sign of whether they are able to adapt positively or not. In fact, numerous studies investigated the willingness to work of hospital workers during disasters including the occurrence of a disease outbreak, and found evidences for possible abandonment (Balicer et al., 2010; DeSimone, 2009; Devnani, 2012 etc.). Therefore, the willingness to work during a future infectious disease outbreak was also chosen to indicate the resilience of hospital workers' after an outbreak.

4.2.1.2. Trait resilience as personal resource

There is a belief that is a general quality which enables individuals to demonstrate a consistent level of resilience across multiple contexts of significant risk. Such personal qualities are understood as resilience by some scholars. For example, Conner and Davidson (2003) defined resilience as personal qualities that allow an individual to thrive in the face of risk. Among the personal qualities that have been popularly topics of research include hardiness (Kobasa, 1982), self-efficacy and sense of humor (Rutter, 1985), tolerance of a negative effect (Lyons, 1991), and optimism (Connor & Davidson, 2003). In this study, such qualities were labeled as trait resilience to avoid confusion.

Currently, it is more general to perceive trait resilience that are known to increase positive adaptation in risk as resource. Resource is actually another important concept to review to understand what resilience is, along with risk and positive adaptation. From Masten's review (2001) on the relationship of risk and resource, which was highly and inversely related with regard to resilience, resource was found to have an opposite effect to that of risk on resilience and it also counteracted the impact of risk. Based on this, there was provided more extensive views on the role of resource in the process of resilience. Richardson (2002) asserted in the theory of resilience, that a positive adaptation to risk (i.e., "resilient reintegration") was accomplished by successful experience of identifying, accessing, and nurturing personal resource. More recent scholars proposed that such utilization of resource in interaction of risk influenced at the multiple stages of resilience process, the appraisal of risk, feeling of emotion, and selection of coping strategies

(Fletcher & Fletcher, 2005; Fletcher & Sarkar, 2013).

While the role of resource is well-acknowledged, so far, no consensus has been reached on which among a number of personal resource factors are the most representative (Richardson, 2002). Consequently, what factors to use and how to measure them are problematic to conduct research. Aware of this, Conner-Davidson Resilience Scale (CD-RISC) (Connor & Davidson, 2003), which comprised of various personal resource factors, was adopted in this study for understanding the resilience of hospital workers after an outbreak.

4.2.1.3. Appraisal of risk

As discussed, risk is a core component of resilience (Luthar & Cicchetti, 2000). In early research on resilience where individuals who accomplished social and personal success despite the obvious life risks were compared with those who did not (Benson, 1997; Gamezy, 1991; Rutter, 1985), a certain risk and its impact was presupposed. This approach contributed to the identification of various personal resources that protected an individual from the impact of the risk. However, it was somewhat limited to the construct of risk and response relationship because the construct neglected the key psychological component, which was, the individual's cognitive appraisal (Gill, 1994).

What is important with appraisal of risk in the resilience process is that it elicits the response to the risk and eventually affects resilience. Fletcher and Sarkar (2012) theorized the resilience process where appraisal of risk was one of the central activities needed to process the impact of risk.

Specifically, the theory explained how people appraised risk in terms of what it meant to them influenced subsequent emotive, cognitive, and behavioral responses, and the demonstration of resilience outcomes resulted from the responses. That is, appraisal of risk not only initiates the resilience process but also influences the entire process.

So far, empirical investigations on the role of appraisal of risk in the resilience process are rare, particularly within the context of a crisis or a disaster. There only a few studies that examined the influence of appraisal of risk on an indicator of resilience. Lopez-Vazques and Marván (2003) found that in a catastrophic risk situation, people perceived a certain kind of risk as the highest priority, and that exposure to such risk generated a high level of stress. Likewise, the hospital workers' perception on various types of risks (e.g., influenza pandemic, natural disaster, and radiation) is used to explain their willingness to work during a disaster related to the risk (Devnani, 2012). In this study, focus was given on how hospital workers perceive the risk of an infectious disease outbreak and how it affects the resilience process of hospital workers.

4.2.1.4. Emotional disruption in the process of resilience

Emotion is one of the direct products of appraisal of risk. It motivates subsequent cognitive and behavioral coping, and by which, coordinates individuals with various tasks involving environmental risks. and therefore, makes them more adaptable (Izard, 2010). In this sense, emotions mediate risks and adaptation, which is also suggested in the resilience theory proposed by Richardson (2002). According to the theory, disruption by

perceiving significant risk posits simultaneously carries to negative emotions, such as hurt, fear, and confusion—in other words, emotional disruption. Such disruption, including emotional disruption motivates people to identify, access, and use their resource to cope with adverse situations. When the activity is successful enough, resilience is accomplished; when it is not, people suffer from loss and despair.

Despite the theoretical posit of emotional disruption, research on emotions in the process of resilience is insufficient. A few studies highlighted emotions as a key theoretical factor in understanding resilience. Montpetit, Bergeman, and Boker (2010) proposed a novel way to conceptualize resilience focusing on the emotional disruption induced by daily stress. Specifically, how people encountered stress without engaging negative emotions (decoupling stress and negative emotions) and how they quickly recovered from the stress-induced negative emotions (damping stress-induced negative emotions) explained resilience. Galatzer-Levy et al. (2013) investigated police officers who were at high risk of exposure to potentially traumatic events. From the study, lower level of negative emotions during academy training was found to predict resilience afterwards.

The importance of emotions even becomes more prominent during disasters, where the magnitude of risk exceeds the usual capacity of problem-solving, and thereby, people experience "emotional turmoil" (Miller, 2002, p. 589). As the intensity of emotional disruption increases, the required personal resource for resilience also increases, and those with limited access to sufficient resource are unlikely to be successful in resilience. In an infectious disease outbreak, hospital workers also present

intensive negative emotional responses such as fear, anxiety, anger, and frustration (Mauder et al., 2003). Unfortunately, such negative emotions experienced by hospital workers have not been fully investigated with regard to their resilience. In this study, the emotional experience of hospital workers during an outbreak is investigated in the resilience process in relation with other prominent factors such as appraisal of risk and personal resource.

4.2.2. Analytic model

To investigate the resilience of hospital workers' after an infectious disease outbreak, the analytic model was constructed (Figure 4). The model was based on what the review of the key concepts prsented in section 4.2.1. suggested with regard to relationships of key conceptual factors in the process of resilience. Specifically, when an infectious disease risk with a traumatic impact occurs, it was highly likely that hospital workers appraised its impact as beyond their routine ways of coping, thus causing them to experience emotional disruption, and processing it in various ways. When it was successful, they achieved resilience as indicated by the likelihood of PTSD and the willingness to work. Meanwhile, trait resilience as a personal resource supported the process through a positive influence on activities at multiple stages: by decreasing the level of perceived risk, negative emotional experience, and the likelihood of PTSD, and increasing the willingness to work in a future outbreak.

The indicators of resilience were hypothesized as a causal relationship. As such, high likelihood of PTSD would decreased the willingness to work in a

future outbreak. Although direct evidence on a relationship was rare, it was known the past experience of damage by a certain risk increases the intention to avoid the risk (Richardson, Sorensen, & Soderstrom, 1987, Zaleskiewicz et al., 2002). Further, to avoid the unrealistic assumptions of complete mediations by negative emotional experience and the likelihood of PTSD, indirect paths from the perceived risk through the likelihood of PTSD to willingness to work and from the perceived risk through negative emotional experience to willingness to work were hypothesized in the model.

In the analytic model, a number of indirect effect pathways were hypothesized. This study intended to examine the role of perceived risk and resource (indicated by trait resilience) in achieving resilience mediated by emotional disruption. Aside from the effect hypothesized by each individual pathway, direct effects and total indirect effects of precedent factors on resilience were also examined. For modeling, the structural equation modeling (SEM) function provided by Stata/IC 13 was used. The measurement models of latent variables were not used as variables with multiple items were measured using tools that were validated in Korean or at least using consented method.

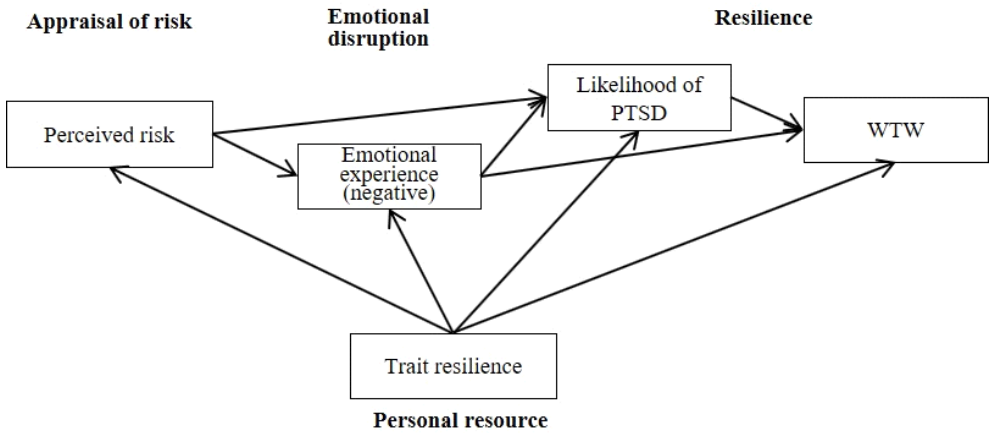

Figure 4. Analytic model of Study 1

Note. WTW: Willingness to work, PTSD: Post-traumatic stress disorder

4.3. Method

4.3.1. Participants

A total of 280 hospital workers from a single hospital influenced by the 2015 MERS outbreak in South Korea participated in the study. Referring to a previous study (Imai et al., 2010) on a range and classification of hospital workers, clinical staff (doctors and nurses), clinical technical/support staff (radiological technologists, clinical laboratory technicians etc.), and non-clinical staff (office workers) were included as participants. They were all directly or indirectly involved in the crisis response activities of the hospital during the MERS outbreak. For comparison between occupational groups, clinical staff was categorized as healthcare worker (HCW) and the remaining two were categorized as non-healthcare worker (non-HCW) group. The data was collected from late August to early September, about a month after the de facto end of the outbreak announced by the public health

authority (July 28), Description for the participants is presented in Table 6.

Table 6. Descriptive characteristics of participants

Variables	N (%)
Age (years)	
20s	138(49.3)
30s	82(29.3)
40s and more	60(21.4)
Gender	
Male	72(25.7)
Female	208(74.3)
Occupation	
Healthcare worker (HCW)	153(54.6)
Non-healthcare worker (non-HCW)	127(45.4)
Tenure	
Less than 1 year	53(18.9)
1-5 years	116(41.4)
More than 5 years	111(39.6)
Total	280

4.3.2. Measurement

The survey questionnaire was used for investigation. The measurement of each factor was as follows.

4.3.2.1. Emotional experience

Emotional experience was measured using the negative and positive dimension of emotions. From the previous study, the use of the dimension was applicable in exploring the role of emotion in achieving resilience rather than using discrete emotions (Galatzer-Levy et al., 2013; Montpetit et al.,

2010). Referring to this, a scale from 1(*negative*) to 9(*positive*) was provided for answering the statement "what is the emotion you have experienced mostly in the middle of the MERS outbreak."

4.3.2.2. The likelihood of PTSD

The likelihood of PTSD was measured using the recently validated Korean version of Impact of Event Scale-Revised (IES-R) (Lim et al., 2009) which was originally developed by Weiss and Marmar (1997). The tool was composed of 22 items (α=.93) and included four components—hyperarousal (6 items), numbness/dissociation (5 items), avoidance (5 items), and intrusion (8 items). A 5-point Likert scale ranging from 0 (*no at all*) to 4 (*very much*) was subsequently used for the response.

4.3.2.3. Willingness to work

In previous studies, the willingness to work of hospital workers during a disaster by a single question, but it was somewhat diverse. For example, some used dichotomous measure (yes/no) (DeSimon, 2009; Imai et al., 2010), while others utilized a Likert-scale (Balicer et al., 2010). Taking into Consideration the purpose of this study-to explore the resilience process using SEM, the measurement using scales was thus adopted. Accordingly, participants responded to the statement "I would take my task for granted when infectious disease outbreaks such as MERS outbreak occur" with a 5-point-Likert scale ranging from 1 (*no at all*) to 5 (*very much*) was used. The statement was modified so that it reflected the willingness to work in a future outbreak.

4.3.2.4. Trait resilience

The Korean version of the Connor-Davidson Resilience Scale (CD-RISC), which was originally developed by Connor and Davidson (2003) and validated in Korean by Baek, Lee, Joo, Lee, and Choi (2010), was used. The tool was composed of 25 items (α=.93) and included 5 components- personal competence, high standards, and tenacity (8 items); trust in one's instincts, tolerance of negative affect, and strengthening effects of stress (7 items); positive acceptance of change and secure relationships (4 items); control (3 items); spiritual influences (2 items). Participants responded using a 5-point-Likert scale that ranged from 1 (*no at all*) to 5 (*very much*).

4.3.2.5. Perceived risk

It is commonly accepted that the perception on risk has two components- "probability of occurrence" of the adversary event and "seriousness/fatality" of the consequence (Yeung & Morris, 2001). Following this approach, two statements for perceived risk of an infectious disease were thus asked: "I might get infected to the MERS" and "If I get infected to MERS, I might die." Participants responded using a 5-point-Likert scale that ranged from 1 (*no at all*) to 5 (*very much*).

4.3.3. Analyses

The mean scores of emotional experience, likelihood of PTSD, willingness to work, trait resilience, and perceived risk were reported and compared between the healthcare worker (HCW) and the non–healthcare worker (non–HCW) group. For the analysis, the mean score of the two components

of the perceived risk was used, which was generally adopted (Kuttschreuter, 2006). Also, the emotional experience score was reversed so that a high score would represent more negative emotions for a better intuitive interpretation of results. The group differences of mean scores of all variables were examined using *t*–test.

Among the variables, emotional experience and likelihood of PTSD was transformed to the category variables and the frequency of each category were also presented. The emotional experience was categorized into three–positive (score 1–4), neutral (score 5), and negative (score 6–9). Regarding with the likelihood of PTSD, the diagnostic cut–off value of 22, which was proposed by Lim et al. (2009), was adopted. Participants with the score of 22 or higher were diagnosed as being at risk of PTSD. The diagnostic efficiency of the cut–off value of 22 was reported as 0.87 with 0.95 in sensitivity as well as 0.80 in specificity. The differences between groups in the categorial variables were examined using chi–squared test.

To test the analytic model, structural equation modeling (SEM) with maximum likelihood estimation was used. First, the goodness–of–fit of the model was evaluated including all participants. For the evaluation, the chi–square statistic (χ^2), comparative fit index (CFI), and root mean square error of approximation (RMSEA) were used. Then, it was tested whether there were between–group differences in structural coefficients in the model. For the test, the goodness of fits of the model without constraints on the structural coefficients (Model 1), thus hypothesizing between–group differences in the coefficients, and the model with constraints on the structural coefficients (Model 2), thus hypothesizing no between–group

differences in the coefficients were seperately evaluated. The significance of the difference in the goodness–of–fit between Model 1 and Model 2 was examined using the likelihood–ratio test. When the significant difference between–group was confirmed, the goodness–of–fit was reported separately by occupational group.

To test indirect effects, non–parametric bootstrap estimation was adopted. According to the recommendation by Mallinckrodt, Abraham, Wei, and Russell (2006), 10,000 iterations and 95% confidence interval (CI) were set for the analysis. All analyses were performed using Stata IC 13.

4.4. Results

4.4.1. Emotional experience

The investigation of the emotional experience of hospital workers during an infectious disease outbreak found that majority of hospital workers experienced negative emotions (52.1%, *n*=146). Positive emotions were experienced by 29.6% (*n*=83) and neutral emotions were experienced by 18.2% of the participants. By occupation group, it was found that the HCW group tended to experience negative emotions more while the non–HCW group tended to experience positive and neutral emotions more. However, the difference was not significant. (Table 7)

Table 7. Emotions of hospital workers by occupational group

	HCW (n=153)	Non–HCW (n=127)	$\chi^2(df)$
Negative (score 6–9)	62(54.9)	84(48.8)	
Neutral (score 5)	26(16.3)	25(20.5)	1.23(2)
Positive (score 1–4)	39(28.8)	44(30.7)	

Note. Values are N(%); $^{*}p<0.05$, $^{**}p<0.01$

The mean score of the emotional experience of all participants was 5.57 (SD=1.90), which indicated negativity. Between the occupation groups, the score of the HCW group was higher (M=5.65, SD=1.86) than the non-HCW group (M=5.47, SD=1.95). However, the difference was not significant, t(278)=-.79, $p \geq .05$.

4.4.2. Indicators of resilience

When applying the cutoff value of 22, it was found that 18.6% of all participants were at risk of PTSD. In comparison between the HCW and the non-HCW group, 23.5% of the HCW and 12.6% of the non-HCW was at risk. The examination on the between-group difference was significant, $\chi^2(2)=5.48$, $p<.05$; that was, the HCW group was exposed to a higher risk of PTSD in an outbreak.

The mean score of the likelihood of PTSD of the participants was 11.10 (SD=13.80) (internal reliability: α=.97). With regard to sub-components, "hyperarousal" was 4.46 (SD=4.46); "numbness/dissociation" was 1.26 (SD=1.88); "avoidance" was 2.24 (SD=3.35); and "intrusion" was 4.20 (SD=5.29). The total mean score of the likelihood of PTSD was also higher in the HCW group, t(278)=-2.61, $p<.05$. In the comparison of

sub-components, the differences were observed in hyperarousal and intrusion. The score of hyperarousal was higher in the HCW group, $t(278)=-2.94$, $p<.05$; the score of intrusion was also higher in the HCW group, $t(278)=-2.87$, $p<0.05$. Although the differences were not significant, the scores of numbness/dissociation and avoidance components tended to be higher in the HCW group than the non-HCW group.

The score of willingness to work in a future outbreak of all participants was 3.67 (*SD*=0.05). It was over the midpoint "3" and thus indicating that the participants tended to be willing to work in a future outbreak. The between-group difference was not significant, while the mean score was higher in the non-HCW group. (Table 8)

Table 8. Indicators of resilience by occupational group

Variables	HCW (*n*=153)	Non–HCW (*n*=127)	*t*(278)
Likelihood of PTSD	13.05(16.42)	8.77(9.28)	**–2.61***
Hyperarousal	5.10(4.90)	3.69(2.54)	**–2.94****
Numbness/dissociation	1.46(2.20)	1.04(1.36)	–1.86
Avoidance	2.57(3.89)	1.85(2.52)	–1.79
Intrusion	5.01(6.24)	3.21(3.64)	**–2.87****
Willingness to work	3.59(0.88)	3.76(0.91)	1.50

Note. Values are mean(*SD*); $^{*}p<0.05$, $^{**}p<0.01$
PTSD: Post–traumatic Syndrome Disorder

4.4.3. Trait resilience and perceived risk

The mean score of trait resilience in all participants was 63.15 (*SD*=14.32) (internal reliability: α=.96). The scores of sub-factors were as follows:

“personal competence, high standards, and tenacity” (Factor 1) was 20.03 (*SD*=0.31); “trust in one’s instincts, tolerance of negative affect, and strengthening effects of stress” (Factor 2) was 17.13 (*SD*=0.26); “positive acceptance of change, and secure relationships” (Factor 3) was 13.58 (*SD*=0.18); “control” (Factor 4) was 7.66 (*SD*=0.13); and “spiritual influences” (Factor 5) was 4.75 (*SD*=0.08).

In the comparison of the HCW and the non-HCW group, the total score of trait resilience was higher in the non-HCW group, $t(278)=2.14$, $p<.05$. In the sub-factors, the score of “personal competence, high standards, and tenacity” (Factor 1) was higher in the non-HCW group, $t(278)=2.51$, $p<.05$. Although the differences were not significant, the scores of other sub-factors tended to be higher in the non-HCW group as well.

The perceived risk score of all participants was 3.02 (*SD*=0.06) (internal reliability: $\alpha=.67$), which was close to the midpoint “3”. However, discrepancy was observed between the sub-components. The score of “possibility of occurrence” (getting infected) (*M*=3.39, *SD*=0.06) tended to be higher than that of “severity of the consequence” (health impacts of the disease) (*M*=2.65; *SD*=0.08). This indicated that the participants tended to perceive that they were likely to get infected with MERS but that the health impacts would not be fatal. In comparison of the HCW and the non-HCW group, the perceived risk score was higher in the HCW group $t(278)=-2.40$, $p<.05$. In sub-components, the “severity of the consequence” score was higher in the HCW group, $t(278)=-3.08$, $p<.01$. Although the difference was not significant, the score of “possibility of occurrence” tended to be higher in the HCW group as well.

Table 9. Trait resilience and perceived risk by occupational group

Variables	HCW (n=153)	Non–HCW (n=127)	t
Trait resilience	61.50(13.97)	65.13(14.33)	**2.14***
Factor 1	19.33(4.98)	20.87(5.20)	**2.51***
Factor 2	16.73(4.32)	17.61(4.27)	1.72
Factor 3	13.30(3.07)	13.91(3.04)	1.65
Factor 4	7.50(2.01)	7.87(2.06)	1.51
Factor 5	4.65(1.40)	4.88(1.31)	1.44
Perceived risk	3.15(1.02)	2.86(0.98)	**–2.40***
Possibility	3.44(1.06)	3.33(1.04)	–0.90
Severity	2.86(1.29)	2.39(1.20)	**–3.08****

Note. Factor 1: Personal competence, high standards, and tenacity, Factor 2: Trust in one's instincts, tolerance of negative affect, and strengthening effects of stress, Factor 3: Positive acceptance of change, and secure relationships, Factor 4: Control, Factor 5: Spiritual influences

Values are mean(*SD*); $^{*}p<0.05$, $^{**}p<0.01$

4.4.4. Model estimation

The analytic model–which hypothesized the relation of appraisal of risk, emotional disruption, trait resilience, and resilience indicators—the likelihood of PTSD and willingness to work—was tested in all participants. The examination of the model–fit presented that the model was acceptable (χ^2=0.45, p=0.501; CFI=1.000; RMSEA=0.000, 90% CI [0.000, 0.138]). To examine whether there were differences between occupational groups in the structural coefficients, the model without constraints on the coefficients, hypothesizing between-group differences (Model 1) and the model with constraints on the coefficients, hypothesizing no between-group differences (Model 2) were compared. The examination on the model fit of each model found that Model 1 was more acceptable (χ^2=0.54, p=0.762; CFI=1.000; RMSEA=0.000, 90% CI [0.000, 0.113]) than Model 2 (χ^2=20.69, p=0.037; CFI=0.925; RMSEA=0.079, 90% CI [0.019, 0.131]). The likelihood ratio test verified the significance of the difference (χ^2=20.2, p<0.05). Therefore, the goodness–of–fit was separately tested by occupational group. In both groups, the model fits were found acceptable (HCW group: χ^2=0.01, p=0.932; CFI=1.000; RMSEA=0.000, 90% CI [0.000, 0.064]; non–HCW group: χ^2=0.54, p=0.464; CFI=1.000; RMSEA=0.000, 90% CI [0.000, 0.210]).

4.4.5. Analysis findings using SEM

The estimation by occupational group yielded some similarities between groups. In terms of direct effects of precedent factors (perceived risk, trait resilience, and negative emotional experience) on resilience, the high level of perceived risk and negative emotional experience lowered resilience in

general. Specifically, the likelihood of PTSD was increased by high perceived risk (HCW group: β=0.42, p<0.01; non-HCW group: β=0.17, p<0.01) and negative emotional experience (HCW group: β=0.17, p<0.01; non-HCW group: β=0.30, p<0.05), while the willingness to work was decreased by negative emotional experience (HCW group: β=-0.21, p<0.05; non-HCW group: β=-0.21, p<0.05). On the other hand, high trait resilience generally raised resilience. In the HCW group, willingness to work was increased by high trait resilience (β=0.24, p<0.01). Similarly, in the non-HCW group, willingness to work was increased (β=0.41, p<0.01) and further, likelihood of PTSD was decreased by high trait resilience (β=-0.18, p<0.05).

In terms of indirect effects, the mediation of the effect of perceived risk on resilience by negative emotional experience was confirmed in both groups. In the HCW group, high perceived risk increased the negative emotional experience, and as a consequence, willingness to work in a future outbreak was decreased (β=－0.05, p<0.05, 95% CI [－0.0987, －0.0011]). In the non-HCW group, high perceived risk increased negative emotional experience and in turn, the likelihood of PTSD was increased (β=0.08, p< 0.05, 95% CI [0.0150, 0.1450]).

The differences between groups were also identified (RQ2). In direct effects, the magnitude of the effect of the perceived risk and emotional experience were found to differ in the explanation of the likelihood of PTSD. Specifically, the HCW group was more affected by perceived risk (HCW group: β=0.42, p<0.05; non-HCW group: β=0.17, p<0.05) while the non-HCW group was more affected by negative emotional experience (HCW

group: β=0.17, p<0.01; non-HCW group: β=0.30, p<0.05). The difference between groups was also observed in the effect of trait resilience. In the non-HCW group, trait resilience decreased perceived risk (β=-0.22, p<0.05) and the likelihood of PTSD (β=-0.18, p<0.05), while it increased the willingness to work (β=0.41, p<0.01). In the HCW group, trait resilience only affected willingness to work (β=0.24, p<0.01), and the effect size was smaller compared to the non-HCW group.

Moreover, in indirect effects, the mediation of the effect of trait resilience on the indicators of resilience by perceived risk and negative emotional experience was only observed in the non-HCW group. That is, trait resilience decreased the likelihood of PTSD through low perceived risk and low negative emotional experience. Despite the fact that each pathway of the indirect effect of trait resilience was not found significant, their total indirect effect was significant (β=−0.08, p<0.05, 95% CI [−0.1525, −0.0078]) (Figures 5 and 6).

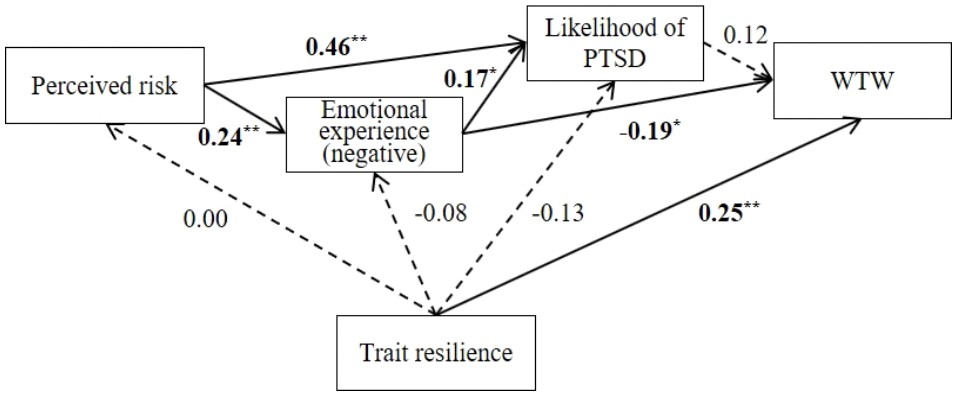

Figure 5. Result of the HCW group

Note. Model fit: χ^2=0.01, p=0.932; CFI=1.000; RMSEA=0.000, 90% CI [0.000, 0.064]

Values are standardized coefficients of the total effect

WTW: Willingness to work; PTSD: Post–traumatic stress disorder

*p<0.05, **p<0.01

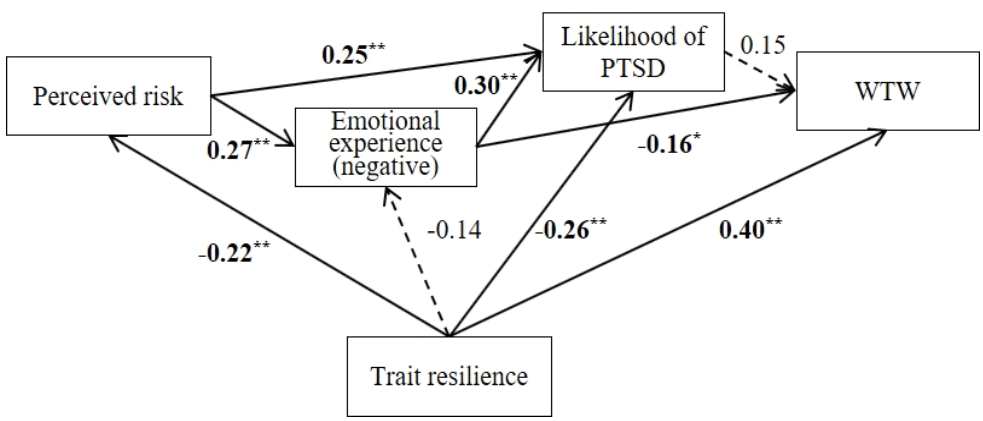

Figure 6. Result of the non-HCW group

Note. Model fit: χ^2=0.54, p=0.464; CFI=1.000; RMSEA=0.000, 90% CI [0.000, 0.210]

Values are standardized coefficients of the total effect

WTW: Willingness to work; PTSD: Post–traumatic stress disorder

*p<0.05, **p<0.01

4.5. Discussion

In Study 1, emotions of hospital workers in an infectious disease outbreak and the effect of the emotions on the social functioning after an outbreak were investigated adopting the resilience concept and models. Specifically, using SEM, the effect of the emotions was investigated in relation with the other prominent factors of resilience–appraisal of risk and trait resilience as personal resource. Furthermore, the results were compared between the HCW and the non–HCW group.

Similar with the previous studies on the hospital worker's emotions during an infectious disease outbreak (Chan et al., 2005; Chong et al., 2004; Lin et al., 2007; Nickell et al., 2004), majority of the participants (52.1%) experienced negative emotions. When a scale was used, the mean score of the emotional experience was found to be over the midpoint, indicating negativity as well. The difference between the HCW and non–HCW group was found insignificant.

While negative emotions were dominant, the hospital workers in this study also reported to experience positive emotions. Positive emotions are often considered unwarranted in a disaster, however, it is suggested that positive and negative emotions may co–occur during adverse situations (Folkman & Moskowitz, 2000). For example, people might feel grateful for being alive and more love for close ones. Similarly, in this study, it was possible that the hospital workers positive emotions during the outbreak.

In the examination of the effect of factors on the resilience of hospital workers (RQ1), the effect of emotional experience was highlighted. In both groups, emotional disruption was not only directly associated with low

resilience but also mediated the effect of perceived risk on resilience. In addition, the effect of perceived risk and the use of personal resource appeared consistent with previous research. That is, the former interrupted resilience while the latter facilitated resilience (Masten, 2001). However, interestingly, in the examination of the effect of trait resilience at multiple stages of the resilience process, trait resilience did not affect emotional disruption in either the HCW or non-HCW group. In other words, even hospital workers with high trait resilience for achieving resilience were unable to avoid the emotional disruption. The possible explanation is that risks of emerging infectious diseases share the characteristics of being unknown and uncontrollable (Langadec, 2007); therefore, during the MERS outbreak, such characteristics of the risk were more influential than those of individuals.

The difference between the HCW and the non-HCWs group in the effect of emotions on resilience were also identified (RQ2). The effect of emotions was found to be more prominent in the non-HCW group, particularly in explaining the likelihood of PTSD. In the non-HCW group, emotional experience presented the largest direct effect. In the HCW group, emotional experience also directly affected the likelihood of PTSD; however, perceived risk was much more influential. Also, the mediation of trait resilience by emotional experience as well as perceived risk was only observed in the non-HCW group.

Another important result found different between groups was that the influence of trait resilience was more pronounced in the non-HCW group as it affected the multiple stage of the resilience process—perceived risk,

likelihood of PTSD, and willingness to work. Meanwhile, only willingness to work was influenced by trait resilience in the HCW group.

Based on defined similarities and differences between groups, implications on how to support hospital personnel during an outbreak in a way to facilitate their resilience after an outbreak were drawn. For the HCW group, it is most important that they do not overstate the degree of risk in facing an outbreak. Therefore, accurate and timely information about the disease is emphasized. Also, in the face of highly threatening disease, protection (e.g., vaccination and protective suits) should be provided so that the risk level in the workplace would be adjusted to the acceptable level. This implication is consistent with the previously investigated needs of healthcare workers after an infectious disease outbreak where information and protection for themselves and the family has been emphasized as well as psychological support (Maunder et al., 2003; Maunder, 2004; O'Bolye, Robertson, & Secor-Turner, 2006;).

Furthermore, the effectiveness of resilience-building programs that focus on facilitating trait resilience (e.g., hardiness) might be limited for the HCW group. On the other hands, for the non-HCW group, such program can be beneficial. Also, relieving the intensity of negative emotions during an outbreak is suggested to be highly important, as well as the strategies for adjusting the level of perceived risk for the non-HCW group.

Recently, with regard to the resilience of hospital workers, use of personal resources from diverse sources are emphasized, which has not been actively explored in this study. For example, Hart et al. (2014) proposed multiple-level approach for building resilience of nurses—individual level

(e.g., maintaining positivity), group level (team) (e.g., debriefing sessions for those who involved in stressful situations), and organizational level (hospital) (e.g., interdisciplinary effective communication). Britt et al. (2016) more directly addressed the diverse sources of personal resources as it categorized the resources into individual (e.g., personality, trait), unit (e.g., cohesion), family(e.g., close connection), and community resource (e.g., connection). Taking this into consideration, in the future studies, emotions of hospital workers should be investigated in relation with diverse personal resources in achieving resilience facing an outbreak.

The limitations of Study 1 are as followed: The data was collected at one hospital and therefore, cautions should be taken when generalizing the implications of the result. Also, the level of close contact to the patients during the outbreak might not be the same across the participants even within the HCW and non-HCW subgroups. Such factors, which possibly differentiated the perception and/or experience during an outbreak, are suggested to be identified and considered in the future. Lastly, as mentioned above, more factors that could explain the resilience of hospital workers—for example, hospital or community resources—may enhance the understanding of the resilience of hospital workers.

5. Study 2

5.1. Research question

In Study 1, the effect of emotions with negative dimensionality on the resilience of hospital workers after an infectious disease outbreak was investigated along with other factors. The results presented that the experience of more intensive negative emotions in an outbreak decreased the resilience after an outbreak. In Study 2, more in-depth exploration on emotions of hospital workers was conducted through an investigation of the specific kinds of negative emotions as well as stress. Further, the stressors that trigger those emotions and stress were also investigated. Accordingly, the following sub-questions arose: (1) what emotions and stress did hospital workers experience during an infectious disease outbreak (RQ1); and (2) what specific triggers were behind those emotions and stress (RQ2).

5.2. Method

5.2.1. Data Collection

The data was produced in June 2015, about two weeks after day 1 of the MERS outbreak. The same hospital where the data used for Study 1 was collected produced the data for Study 2 as well. During the MERS outbreak, the hospital provided a session program for hospital workers to share what they were going through inside their mind. At the end of the session, the participants posted anonymous short notes on the “Let It Out” panel. In the short notes, the hospital workers described the emotions and stress they experienced, and the triggers behind those feelings and stress.

Fifty–nine department heads initially participated in and learned from the program. They subsequently implemented the program to their respective departments as they played the role of the moderator. Overall, 156 short notes were posted in the "Let It Out" panel. The notes were collected and electronically transcribed for analysis of hospital workers' emotions, stress, and the triggers behind them. As the data was prospectively produced by the hospital for the independent purpose of providing support to their workers to relieve their emotional load, the data had a low risk of recall bias or of any manipulation by researchers.

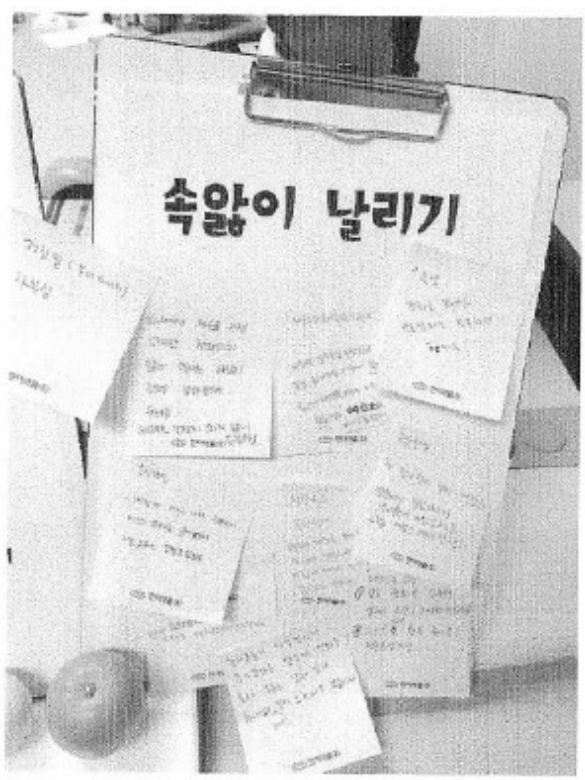

Figure 7. "Let It Out" panel

5.2.2. Data Analysis

Two different analysis approaches under qualitative methodology were adopted to meet the purposes of the study—qualitative content analysis and thematic analysis. As commonly used methods in a qualitative descriptive study, they both aims to analyze narrative information by breaking it into smaller units in order to find meaningful patterns (Sparker, 2005). Still, there are differences.

The core feature of qualitative content analysis is systematic coding and categorizing. For this reason, it is more suitable for the simple reporting of issues in the data (Green & Thorogood, 2004). Further, it is possible to quantify data using qualitative content analysis as the quantitative counts of codes may provide additional interpretation of the data (Downe-Wamboldt, 1992; Morgan, 1993). On the other hand, thematic analysis is a purely descriptive approach and more suitable for the provision of a rich, detailed, and complex account of the data (Braun & Clarke, 2006).

In this study, emotions and stress are dealt as types or kinds; therefore, suitable for the reporting of kinds and also frequencies. On the contrary, triggers are the underlying context of the emotions and stress and thus, more complex. For this reason, qualitative content analysis was adopted for the analysis of emotions and stress; while thematic analysis was adopted for the analysis of triggers behind the emotions and stress.

5.2.2.1. Analysis of emotions and stress

To analyze emotions and stress of hospital workers in an infectious disease outbreak, the process of qualitative content analysis—preparation,

organizing, and reporting was followed.

Table 10. The process of qualitative content analysis (Elo & Kyngäs, 2008: 110)

Steps	Description
1. Preparation	Being immersed in the data and obtaining the sense of the whole, selecting the unit of analysis, the deciding on the analysis of manifest content or latent content.
2. Organization	Open coding and creating categories, grouping codes under higher order headings, formulating a general description of the research topic through generation of categories and subcategories as abstracting.
3. Reporting	Reporting the analysis process and the results through models, conceptual systems, conceptual map or categories, and a story line.

In the preparation step, the analysis of unit and whether the analysis should be on the manifest or latent content was decided. As the analysis unit, a meaning unit, "the constellation of words or statements that relate to the same central meaning" (Baxter, 1991) was selected for this study. Also, it was decided that both manifest and latent content were to be analyzed because emotions and stress can both revealed as well as expressed. Therefore, even though the state of mind was not represented by words, it was interpreted if there were sufficient information for interpretation.

In the organization step, categories for emotions and stress were created using previous propositions of psychology scholars. For the systematic coding of the contents of the short notes, two separate steps were taken:

first, words or expressions of emotions and stress were identified. Then, the identified words or expressions were categorized into the predefined emotion and stress category. Lastly in the reporting step, the kinds and the frequencies of emotions and stress experienced by hospital workers in an outbreak were reported.

More details of the organization step were as followed: in creation of the categories of emotions and stress, a set of universal emotions supplemented by emotions specific to disasters, which were reported to be predominantly present during disasters. Six basic human emotions, as suggested by Ekman and Oster (1971), were subsequently used: anger, sadness, happiness, disgust, fear, and surprise. They provided the evidence of the six distinguishable emotions through an examination of facial expressions of multicultural participants. In order to adjust the basic emotion category to be more representative of disasters, happiness was excluded.

Furthermore, the six predominant negative emotions in disaster, which were proposed by Lazarus (1991), were taken into consideration. The core relation themes of the six emotions—anger, anxiety, sadness, fright, guilt, and shame (Lazarus 2006)—were subsequently examined, where it was found that anxiety, guilt, and shame could be added to the basic category as a distinctive status of the mind. Furthermore, under consultation with an expert in psychology, “fright” was divided into “fear” and “surprised” that were already in the basic category. Consequently, eight emotions were finalized for the emotion category of this study: anger, anxiety, sadness, fear, surprise, disgust, guilt, and shame. If the status of the mind presented in the short notes was unlikable and cannot be categorized into any of them, it

was categorized as “others.” Stress was separately coded.

In order to identify emotions presented in the short notes, two dictionaries of emotion-related Korean words (Park & Min, 2005; Sohn & Park, 2012) were used as reference. They both used the Korean “word frequency list” developed by Yonsei University and went over multiple steps of a selection process with the numbers of researchers with expertise included. The said dictionaries were used in three ways.

First, emotion-related words from the contents of the short notes were coded if they were matched to either Sohn’s list or Park’s list (matched case). Second, when the words were not matched but thought to be emotion-related, similar words from the lists were searched to ensure that those were emotion-related words (unmatched case). Third, in cases where the state of mind was not represented by any emotion-related words, they were interpreted using the contents of the short notes—if there were sufficient information for interpretation—and the emotion-related words were thus coded using the words from the two dictionaries (interpreted case).

Stress-related words were coded in a similar way that the emotion-related were coded. Whether the words were related to stress of not was decided based on the definition—the process of appraising negatively affective events and one’s ability to deal with them—provided by Lazarus and Folkman (1984)

Table 11. Application of emotion-related Korean words dictionaries

	Case	Description	Example
Manifest	Matched	Matched to the words in either of the dictionaries	“I was afraid that I might get infected and without my knowledge, infect my elderly parents.” → “Afraid” was matched to the words in Sohn's dictionary; therefore, the data was coded as such
	Unmatched	Matched after alteration to similar words	"Why the secrecy? It only raised distrust!!" → “Distrust(불신)” was not matched to the words in Sohn's dictionary; however, a word with similar meaning “mistrust(못미덥다)” was in the dictionary. Therefore, it was coded as such.
Latent	Interpreted	Emotion-related words were not manifest, but it was possible to interpret the contents	"Why the secrecy? It only raised distrust!!" → “Resentful” was interpreted to be contained from the tone; therefore, the data was coded as such

As mentioned in the preparation step, the analysis unit is a meaning unit. Therefore, more than one word was allowed to be coded per short note if there were plural or multiple meaning units in a note. The coding were exclusively conducted by two coders (inter-coder reliability: α=0.86), and any discrepancy was resolved through discussion. The coding of unmatched and interpreted cases were consulted by an expert.

After the coding of the contents of the short notes with emotion-related and stress-related words, the words should be categorized into the 10 categories defined previously (8 emotions, plus "stress" and "others"). As Sohn's dictionary categorized the listed words into emotions, it was used in this study when the extracted words were matched with the words from Sohn's list. Some of the unmatched cases, where words that were identified as similar with those of the extracted ones and were found in Sohn's list, were also referred to Sohn's categorization results. Of course, as the emotion category Sohn's study used was not exactly the same with the ones used in thise study (six emotions were overlapped) and an adjustment was subsequently made.

Moreover, even when the word was matched and the emotion category of the word overlapped, some categorization results were unacceptable. For example, *dapdaphada(*답답하다*)* (feeling stuffy or suffocating) was categorized as boredom in Sohn's study. However, taking the context of an outbreak into consideration, the emotion related to the word in the short was closer to anger. In cases where the coded emotion-related words were not matched to Sohn's list, the categorization of words to emotions was judged by the coders. The words coded as stress-related were subsequently

categorized as “stress.” Same with the coding of emotion-related words, two coders conducted the categorization (inter-coder reliability: α=0.89) and went through a consensus process. The categorization results were consulted by an expert.

The categorizations of the emotion-related and stress-related words were presented in Table 12. Some emotion categories were the mixture of more than one emotion as the dictionaries state. This means, that such words represented a mixture of emotions. The kinds and the frequencies of the emotions and stress experienced by hospital workers were reported in the result part.

Table 12. Categorization of emotion-related words

Emotion category	Categorized emotion-related words
Anger	Stifling, resentful, irritated, angry, furious, dissatisfied, sarcastic, absurd, bastard, suspect
Anxiety	Anxious, worried, daunted, concerned, uncomfortable
Disgust	Distrust, mistrust
Fear	Afraid, fearful
Guilt	Uncomfortable, guilty
Sadness	Sad, upset, regrettable, sorry, distressed, heartbroken, hurt, lamentable, lonely
Shame	Self-reflecting, ashamed
Surprised	Taken aback
Stress	Difficult, straining, stressful, hard
Disgust + Anger	Hate
Sadness + Anger	Helpless, feeling useless
Surprise + Anger	Mind-blowing, baffled, embarrassed

Note. Categorization of words to "others" or the mixture that includes "others" were omitted from the table presentation

5.2.2.2. Analyses of the triggers behind emotions and stress

To analyze the stressors that triggered negative emotions and stress, the thematic analysis process was followed.

Table 13. The process of thematic analysis (Braun & Clarke, 2006: 87)

Step	Description
1. Familiarizing with data	Transcribing data, reading and rereading the data, noting down initial ideas.
2. Generating initial codes	Coding interesting features of the data systematically across the entire data set, collating data relevant to each code.
3. Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes	Checking if the themes work in relation with the coded extracts and the entire data set, generating a thematic map.
5. Defining and naming themes	Ongoing analysis for refining the specifics of each theme and the overall story that the analysis tells, generating clear definitions and names for each theme.
6. Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, and producing a report of the analysis.

In the step of familiarizing with the dat, the transcribed short notes were read a number of times and intial ideas were noted down. In generation of intial codes, the interesting features of the data which entailed the emotions and stress of hospital workers were marked, which were subsequently organized as meaning units for analysis. Then, two kinds of condensed information of the meaning units—"description close to the feature" and "interpretation of the underlying meaning"—were coded. Under each code, relevant data were collated.

In the step of searching for theme, a two-step of collation was performed. The codes were collated codes into the potential subthemes first, and then, the subthemes were collated into the themes. Under the themes, relevant data were gathered. In the step of reviewing themes, the themes and the subthemes were reviewed in relation with the codes and the data.

In the step of defining and naming theme, the themes and the subthemes were defined and labeled by reviewing the overall story of how they triggered emotions and stress among hospital workers in an infectious disease outbreak. The example of generating codes and collating them the themes and subthemes was presented in Table 14.

In the step of producing the report, the most representative and vivid data of the each subtheme and theme with regard to the research question of this study were selected. Furthermore, the data and the results of emotion and stress analysis were matched to specify triggers and the triggered emotions/stress. For example, when a meaning unit was found to present emotion A from a qualitative content analysis of emotions, and theme B from a thematic analysis of triggers, theme B was considered to trigger emotion A.

Table 14. Example of generating and collating codes into themes

Meaning unit	Condensed meaning unit 1: Description close to the text	Condensed meaning unit 2: Interpretation of the underlying meaning	Sub-theme	Theme
I was nervous and I felt stifled as I know nothing about what was going on in my workplace	Not knowing about the situation of one's own workplace	Not properly informed by the hospital as an employee	Lack of information sharing inside the hospital	Mistake, missing, delay due to communication failure
As a health-care worker, I felt helpless as I can't disclose any information to my family and friends when they asked me about my workplace simply because I don't have anything to tell them	Unable to help people close with them because of not knowing anything about the situation of one's own workplace	Not have enough information to use as healthcare professionals		
I had to lie when I received phone calls asking if there were	Knowingly lied about the presence of MERS patients in the hospital following the	Being instructed to conceal the fact to local patients		

Meaning unit	Condensed meaning unit 1: Description close to the text	Condensed meaning unit 2: Interpretation of the underlying meaning	Sub-theme	Theme
MERS patients in the hospital	hospital's instruction			
I just followed the instruction and said that there were no MERS patients. The news outlets then widely reported that MERS patients were being treated in and discharged from our hospital. What happened baffled me a lot because, after all, the frontline hospital workers lied	Lied about the presence of MERS patients in the hospital following the hospital's instruction, which was later exposed	Being in a difficult situation after following the instruction to misinform local patients	Improper instruction in communicating with the community	

5.3. Results

5.3.1. The emotion and stress experienced by hospital workers

Overall, 166 emotion-related words and stress-related words were coded from the contents of the short notes. Among those, 132 were matched cases, 13 were unmatched cases, and 21 were interpreted cases. The categorization of the coded words into emotions and stress yielded diverse emotions and stress experienced by hospital workers during an infectious disease outbreak such as anxiety, stress, anger, sadness, fear, guilt, disgust, shame, and surprise. Among those, anxiety (37 counts, 22.3%), stress (35 counts, 21.1%), and anger (32 counts, 19.3%) were the most frequently reported. These were followed by sadness (25 counts, 16.0%) and fear (11 counts, 7.1%). Guilt was reported three times, disgust and shame were reported twice, while surprise was reported once. Emotions other than the eight emotions ("others") were reported eight times. Regarding mixed emotions, surprise+others was reported five times; surprise+anger was reported twice; and sadness+anger, disgust+anger, and were reported once.

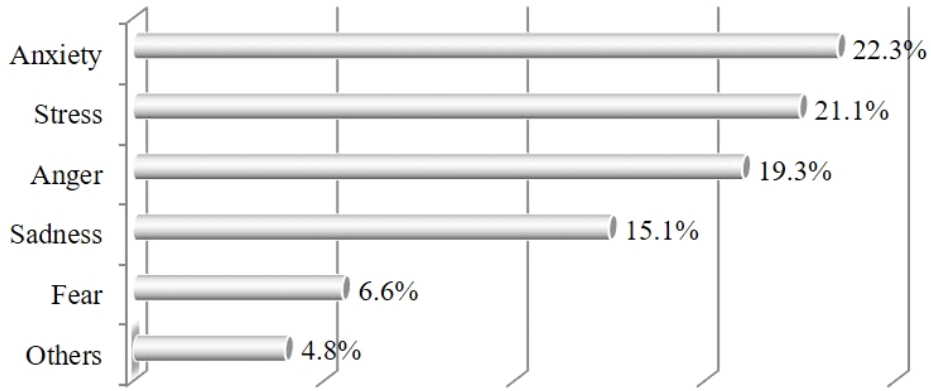

Figure 8. Emotions and stress of hospital workers

Note. Frequencies that were less than five were not presented in the figure.

5.3.2. Triggers of emotions and stress

Four themes that triggered emotions and stress among hospital workers in an infectious disease outbreak were identified using a thematic analysis. (Table 15).

Table 15. Themes and subthemes

1. My workplace becoming an unsafe area
1a. Risk of getting infected and infecting close others
1b. Large volume of patient decrease
2. Stigmatization on myself and my family
2a. Being avoided in public places
2b. Forced alienated from a close group
3. Mistake, missing, delay due to communication failure
3a. Lack of information sharing inside the hospital
3b. Improper instruction in communicating with the community
4. Mistrust and blame for loss of responsiveness
4a. Community members' aversion to a hospital visit
4b. Community members' blame for dishonesty

The detailed descriptions of the themes and the subthemes, including the triggered emotions by theme and subtheme, were as follows.

Theme 1: My workplace becoming an unsafe area

Subtheme 1a: Risk of getting infected and infecting close contacts. The hospital workers felt anxiety (e.g., "nervous," "worry"), fear (e.g., "afraid"), and sadness (e.g., "sorry") when they thought that they might become infected with MERS and even become a virus carrier and pass on the infection to their significant others (e.g., family and/or patients).

"I feel so nervous that I might catch MERS." (Note #95)

"I am afraid that I might get infected and without my knowledge, infect my elderly parents." (Note #81)

> "I feel so sorry for my family. What if they get infected with MERS because of me? (crying text emoticon)." (Note #140)

Subtheme 1b: Large volume of patient decrease. As the hospital was known to treat MERS patients, there was a drastic decrease in the number of local outpatients. This news, in itself, brought fear to the hospital workers. Moreover, the employees were very anxious (e.g., "worry") about its future impact on their job security and whether the hospital would try to compensate for the financial damages caused by the decrease in patient volume.

> "As MERS spread, the number of outpatients in our hospital suddenly and drastically decreased. I feel fearful because of the situation." (Note #27)
>
> "I think our hospital's financial management would be difficult because of the decrease in the number of patients, and I am worried about whether I would be able to receive my salary or not." (Note #26)
>
> "Please do not give us a hard time! I already cried because of MERS, and I don't want to cry again because of the salary cut." (Note #97)

Theme 2: Stigmatization on myself and my family

Subtheme 2a: Being avoided in public places. The hospital workers were stigmatized as high-risk spreaders and were avoided and rejected in various

places such as public transportation hubs. This avoidance provoked sadness and anger.

> "When they recognized where I worked, they shunned me. I am really upset." (Note #58)
> "People who do not know much about MERS say bad things about hospitals on the Internet and shun hospital workers. It is heartbreaking and resentful as we are working really hard now. I has been also refused by a taxi." (Note #111)

Subtheme 2b: Forced alienated from a close group. The hospital workers and their family members were picked on by their close groups, at work, in school, or in their community, which made them sad.

> "During the initial stage of the MERS outbreak, people started to be concerned about which hospitals were treating MERS patients. My little brother innocently said at his workplace, 'My sister works at M hospital.' After that, he was sent home without letting him know why. Seeing him at home at such an early hour broke my heart as he was also the object of prejudice just because he has a sister working in a hospital as a nurse." (Note #110)
> "In an online chat-room where members were parents of the class to which my kids belonged, a mother said that she felt afraid because a physician from our hospital lived in the same apartment complex as her family. Another mother asked if someone's mother

in the class was working at our hospital. I couldn't say anything (crying text emoticon)." (Note #3)

Theme 3: Mistake, missing, delay due to communication failure

Subtheme 3a: Lack of information sharing inside the hospital. During the initial stage of the MERS outbreak, employees were not informed that MERS patients were being treated in their hospital. This left employees uninformed about what was happening in their own workplace, which caused feelings of anxiety (e.g., "nervous") and sadness (e.g., "feeling helpless"). Moreover, they felt anger (e.g., "stifled") and disgust (e.g., "hate") toward the decision.

"I am nervous and I feel stifled as I know nothing about what is going on in my workplace." (Note #99)

"As a healthcare worker, I feel helpless as I can't disclose any information to my family and friends when they ask me about my workplace simply because I don't have anything to tell them." (Note #11)

"Hospital did not notify us that patients with MERS were being treated here. After Chosun newspaper reported the presence of the patients, the hospital sent us a text message that they would be transparent and would disclose information from now on. I hate that." (Note #86)

Subtheme 3b: Improper instruction in communicating with the community. The initial strategy of hospital management for communicating with the community was to conceal the presence of MERS patients in the hospital, which was revealed by news outlets. Furthermore, there was a lack in the instructions on how to respond effectively to highly concerned community members. This failure provoked anger (e.g., "baffling"), stress (e.g., "hard"), and shame/guilt.

> "I had to lie when receiving phone calls asking if there were MERS patients in our hospital." (Note #93)
> "The parents from my daughter's school asked me if our hospital was treating MERS patients; I said "no," which made me feel ashamed of myself at that moment." (Note #98)
> "I just followed the instruction and said that there were no MERS patients. Them, the news outlets widely reported that MERS patients were treated in our hospital. What happened baffles me a lot because, after all, the frontline hospital workers lied." (Note #4)
> "I suffered from a zillion inquiries after the news reports, but the hospital did not tell us what to say and what not to say, or how to respond to them. It was just so hard." (Note #75)

Theme 4: Mistrust and blame for loss of responsiveness

Subtheme 4a: Community members' aversion to a hospital visit. The outpatients who were mostly from the community distrusted the hospital's safety and refused to visit. When they needed medical service, they made

requests that were against current medical practices, such as medical consultations and prescriptions via telephone and fax, so that they could avoid visiting the hospital. This avoidance provoked stress among hospital workers.

> "I understand that they are worried, but there are just too many phone calls asking if it is absolutely safe to visit the hospital. It is really stressful to take care of multiple cancellations and rearrangements of visits." (Note #25)
>
> "Every day, what I do first in the morning is to receive phone calls from outpatients. They say that they don't want to come to our hospital because of MERS and ask for medical consultation from physicians via telephone. It is straining to respond to them." (Note #91)
>
> "What is hard was that… (omitted)… I is asked too many times to send medical prescriptions via fax." (Note #71)

Subtheme 4b: Community members' blame for dishonesty. After the news outlets had reported about MERS patients being treated from the hospital, the community began to lose its trust. The hospital workers were blamed by community members, that they were dishonest and irresponsible, even after the patients were discharged and no longer present. This provoked stress and sadness.

> "Things are hard for me… (omitted)… it was hard when they

yelled at me that they knew everything and that what I was saying was just a flat-out lie" (Note #62)

"What hurt me is that… (omitted)… he was already sure that there were MERS patients in our hospital and asked me why I was lying to him." (Note #19)

"He did not believe my words that there were no MERS patients in our hospital any longer so I referred him to the Center for Disease Control and Prevention in Korea. At that point, he yelled at me that I should take responsibility if he visited our hospital and became infected. I am so upset." (Note #79)

The themes of triggers and the triggered emotions and stress are summarized in Table 16.

Table 16. Triggered emotions by theme

Theme	Emotion
My workplace becoming an unsafe area	Anxiety, fear, sadness
Stigmatization on myself and my family	Anger, sadness
Mistake, missing, delay due to communication failure	Anger, anxiety, disgust, sadness, shame/guilt, stress
Mistrust and blame for loss of responsiveness	Sadness, stress

5.4. Discussion

Study 2 focused on various emotions and stress of hospital workers during an infectious disease outbreak. Also, specific stressors or risks that triggered those emotions and stress were also investigated. For the investigation, the short notes produced by hospital workers in the middle of the MERS outbreak was to let out their inner feelings, and therefore, free of recall bias and manipulation by researchers were analyzed. A qualitative content analysis on emotions and stress yielded anxiety, anger, and stress as most prominently experienced by hospital workers in an outbreak. Sadness, fear, guilt, disgust, shame, and surprise were also experienced (RQ1).

Using a thematic analysis, four themes that trigger the emotions and stress among hospital workers during an outbreak were found: “my workplace becoming an unsafe area”; “stigmatization on myself and my family”; “mistake, missing, delay due to communication failure”; and “mistrust and blame for loss of responsiveness” (RQ2). Noticeably, the themes of the triggers occurred at multiple levels. The two themes of “my workplace becoming an unsafe area” and “stigmatization of myself and my family” are at the individual level and seemingly familiar from previous studies (Maunder, 2003; Maunder et al., 2003; McAlonan et al., 2017). In contrast, the other two themes have wider contexts: “mistake, missing, delay due to communication failure” is at the hospital organizational level and “mistrust and blame for loss of responsiveness” is at the community level. These themes with wider contexts have not been highlighted in previous studies.

Each of these themes either stood alone or was accompanied by others

related to the issues of human resource management of hospital workers in an infectious disease outbreak. Therefore, suggestions for human resource management, which could moderate the psychological impact of an outbreak on hospital workers, are thus proposed. First, similar to one of the suggestions in Study 1, the workplace risk of hospital workers should be reduced to acceptable levels. The provision of appropriate protection measures for hospital workers and their families is applicable (e.g., information, safeguards, vaccines, and medicines) (Nekoie–Moghadam et al., 2016; O'Boyle, Robertson, & Secor–Turner, 2006; WHO, 2009; Zhong, Clark, Hou, Zang, & Fitzgerald, 2014). Such lowered levels of workplace risk could relieve fear and anxiety of hospital workers. Also, those of community members about hospitals and hospital workers can be relieved as well, and thus, the issue of people avoiding hospitals and hospital workers could be resolved.

Second, hospital workers should be provided proper internal and external crisis communication principles and strategies. The importance of communication during an outbreak has already been emphasized strongly and repeatedly (Dickmann, Biedenkopf, Keeping, Eickmann, & Becker, 2014; Gesser–Edelsburg et al., 2015; Zucker, Whalen, & Raske, 2016). Clear, accurate, and timely communication is known to enable informed decision–making and cooperation within the hospital as well as promote public relations (Nekoie–Moghadam et al., 2013; World Health Organization [WHO], 2009; Zhong, Clark, Hou, Zang, & Fitzgerald, 2014). In particular, the data of this study revealed the importance of internal communication of in a hospital organization, which has been surprisingly neglected during an

outbreak. Heide and Simonsson (2014) pointed out that fulfilling the need that hospital workers have for information is crucial as they are all "ambassadors and communicators" of a hospital who respond to the outside (e.g., patients, journalists, and government officials).

Lastly, the hospital worker should be aided in building a cooperative relationship with the community. As inferred from the data, hospital workers and the outside community members often consider each other as adversaries in an outbreak. Inarguably, hospitals take the utmost role in responding to an outbreak; however, disjointed disaster preparedness and response can often lead to failure (Maldin et al., 2007). In the United States, hospitals were recognized as an integral component of the community's response to a crisis after the 9/11 attack, a recognition that eventually contributed to an increase in hospital preparedness and response (Barbera, Yeatts, & Macintyre, 2009).

There are a few limitations in Study 2. First, the data included a wide range of hospital workers with diverse levels of participation in responding to the MERS outbreak. On one hand, the stressors behind the negative emotions and stress of hospital workers with relatively low risk of infection are likely to be different form those with high risk (Maunder et al., 2003), which presumably contributed to identify more diverse trigger at the multiple levels. Also, the stress level of those with low risk of infection was not found different from those with high risk (Lin et al., 2007); therefore, they were all eligible for being included in the study. However, on the other hand, the experiences could not be distinguished by subgroups with risk levels or other sociodemographic/occupational factors because the notes were

completely anonymous. Thus, it is difficult to draw implications differentiated by subgroups. Second, as the data were collected at a single hospital, the findings may not be applicable to other hospital settings.

6. Study 3

6.1. Research Question

Study 3 focused on the primary emotions that the general public experienced during an infectious disease outbreak, and investigated how they induced subsequent cognitive and behavioral changes as well as how they were constructed by cognitive appraisal regarding an outbreak. The focus was given in the difference among discrete emotions (fear, anger, anxiety) in their construction and effect: (1) how the emotions are constructed by the appraisal of the non-dailiness caused by an outbreak (RQ1); how the emotions affect the public's protective behaviors in an outbreak and the risk perception after an outbreak (RQ2); and (3) whether the effects of emotions would interact with other factors (RQ3).

6.2. Theoretical background and hypotheses

According to the cognitive emotion theory elaborated in the introduction, emotions are constructed by one's cognitive appraisal of an event (more likely a stressor in risky situations) in how it means to the person (Lazarus, 1991). The appraisal that provokes each emotion is different from one another, which accords the emotions with a distinctive underlying cognitive structure. Such distinctiveness of cognitive structures renders emotions to lead in a particular way of perception and behaviors (Frijda, 1987; Lerner & Keltner, 2000). The specified hypotheses by the research question are as follows.

6.2.1. Construction of emotions by cognitive appraisal

As mentioned, each emotion is constructed by a specific appraisal. Lazarus (2006) proposed that anger was constructed by the appraisal of an event as "a demeaning offense against me and mine," anxiety by the appraisal of an event as "an uncertain and existential threat," and fear by the appraisal of an event as "an immediate, concrete, and overwhelming physical danger." A more concise approach of focusing on the dimensions of the appraisal was also made by Lerner and Keltner (2000) where fear and anger were contrasted in the dimensions of controllability and certainty: fear arose when a risk is appraised as uncontrollable and unpredictable while anger arose when a risk is appraised as controllable and predictable. Likewise, in terms of investigating emotion arousal by risk, various aspects of risk—including controllability and predictability—were considered to construct emotions. Among such aspects, it was evident that the potential of disrupting dailiness (non–dailiness) would have high relevance to emotional distress of the public in an outbreak (Lee et al., 2016). However, studies wit regard to how the appraisal of the non–dailiness constructs fear, anger, and anxiety specifically remain insufficient. Thus, the following research question was addressed.

RQ1: How will the perception of non–dailiness construct anger, fear, and anxiety in an infectious disease outbreak?

6.2.2. Effect of emotions on behaviors

A theoretical approach to the effect of emotions on behaviors hypothesizes the function of each emotion that is in accordance with its

cognitive structure. To fulfill the function, the state of readiness to perform a certain kind of action (action tendency) is activated, which possibly carries over to actual actions. In early works that specified the relationship of emotions and action tendencies, various modes of action tendencies were used (e.g., Frijda, 1987). Here, specific concerns were on the motivational direction of the action to risk; therefore, a division of two action tendencies were adopted: approach versus avoidance. Given that the division was known to be a significant basis of differentiating negative feelings (Carver & Harmon-Jones, 2009), it was expected to be effective in examining the effect of emotions on behaviors during an outbreak where negative feelings were dominant.

Originally, fear was found to activate avoidance tendency, anger activated antagonism tendency, while anxiety activated inhibition tendency by Frijda (1987). Using two the categories of action tendencies, the action tendencies of anger and anxiety should be recategorized into either approach or avoidance tendency. Examining the function of anxiety, to take "caution," anxiety was hypothesized to be related with avoidance tendency confronting risks, which could be easily accepted.

On the other hand, there were controversy about what action tendency anger induced in the face of risk. Frijda's proposition on the function of anger—"controlling" situations for desirable states (e.g., safe)—supported the approach tendency (Frijda, 1987). In contrast, Lang, Bradley, and Cuthbert, (1998) considered anger as a threat signal, just like fear, that guided people to avoid the perceived threat. This view supported approach tendency.

More recent exploration on the controversy found that anger shifts roles

to activate either avoidance or approach tendency depending on the context. Aarts et al. (2010) verified the action tendency activated by anger changed from avoidance to approach a risk when there was an expected reward by approaching. Similarly, Ferrer et al. (2017) proposed the reward context as a possible explanation as to why risk–taking behaviors (approach) were commonly activated by anger in many experiments—because risk–taking (approach) suggested rewards (e.g., risk–taking raised the possibility of earning money in an experiment using gambling).

An important implication provided by Ferrer et al. (2017) is, if risk–avoiding behaviors (avoidance) are rewarding, anger induces avoidance tendency. Applying this to protective behaviors in an outbreak, angry people would adhere to the behaviors if they perceive those as beneficial enough. While the role shifting of anger by reward is clear, however, there remain insufficient evidences on whether the protective behaviors are actually regarded as rewarding and, if they are, which behaviors specifically. For this reason, a research question is addressed for the effect of anger on protective behaviors in an outbreak. For the effect of fear and anxiety, the following hypothesis is addressed:

RQ2−1: How will anger influence various protective behaviors in an infectious disease outbreak?

H2−1: Fear and anxiety will increase only protective behaviors of avoidance, not of approach in an infectious disease outbreak.

6.2.3. Effect of emotion on cognitive perception

A theoretical approach on the effect of emotions on cognitive perception

hypothesizes a certain cognitive predisposition of emotions that is in accordance with their cognitive structure. According to Lerner and Keltner (2000), anger, arisen from the appraisal of risk as controllable predictable, leads people to have an optimistic view on the situation with the risk. Therefore, angry people tend to have a low risk perception. In contrast, fear and anxiety, arisen from the appraisal of risk uncontrollable and unpredictable, leads people to a pessimistic view. Therefore, fearful or anxious people tends to have high risk perception. Such appraisal tendency of optimism or pessimism induced by emotions is found to be prolonged substantial within a amount of time after the situation where emotions are initially provoked (Lener & Kelter, 2001). Adopting this, the effect of emotions on the risk perception of the disease after an outbreak is hypothesized as follows:

H2−2: Anger will decrease the risk perception of the disease after an outbreak

H2−3: Fear and anxiety will increase the risk perception of the disease after an outbreak

6.2.4. Interaction with sociodemographic factors

The interactive effect of sociodemographic factors and emotions on the people's perception and behaviors are investigated. In relation to emotions, the investigation was concentrated on gender among the factors. The stereotype on emotion by gender asserted each gender experiences certain kinds of emotions more than the other. For example, fear, surprise, sadness, guilt, and shame were experienced and expressed more by females while

anger, contempt, and pride were experienced and expressed by males (Algoe, Buswell, & DeLamater, 2000; Hess et al., 2000; Plant, Hyde, Keltner, & Devine, 2000; Parmley & Cunningham, 2008). Furthermore, according to the stereotype, females not only experienced and expressed emotions more intensively (Robinson, Michael, & Johnson, 1997) but also thought over the negative emotional experience (Strauss, Muday, McNall, & Wong, 1997). Gender effect was also reported in how people perceive risks and make decisions on risk-related behaviors. That was, males generated lower risk estimation and were more likely to take risks (Slovic, 1999).

Considering the gender effect on emotions as well as the perception and behaviors in risky situations, gender and emotions are likely to interact. However, evidences found in previous studies are few and inconclusive. In Lerner et al. (2003), the results failed to a present significant interaction between gender and emotions (fear and anger) on risk evaluation. On the other hand, Similarly, Ferrer et al. (2017) found angry males were more likely to take risks than angry females, which was interpreted as that males have more necessity take risks when such action was induced by anger because of their evolutionary role to come forward as a bread winner and safeguard of the family.

In addition to gender, age and emotions are also likely to interact with each other. When it comes to disease risks, health impacts could be more serious in an aged population. In fact, during the MERS outbreak, older age ($\geq$65 years) was strongly associated with the mortality from MERS (*OR*=4.86, 95% CI [1.90, 12.45]) (Korean Center for Disease Control and Prevention [KCDC], 2015). Such difference in disease impact by age could

also cause differences in emotions and behaviors during an outbreak as well as risk perception after an outbreak. However, the evidences are rare on the subject. Therefore, research questions on the interactive effects were addressed as follows:

RQ3−1: How will age influence the effect of emotions on protective behaviors during an outbreak and risk perception after an outbreak?

RQ3−2: How will gender influence the effect of emotions on protective behaviors during an outbreak and risk perception after an outbreak?

The summary of research questions are presented in the figure below.

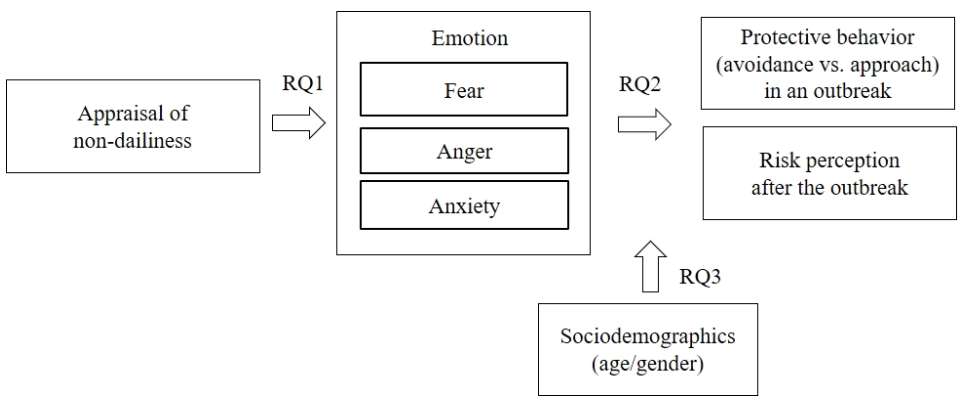

Figure 9. Analytic framework/model of Study 3

6.3. Method

6.3.1. Data collection

The data was collected using survey method from January to February of 2016. This was five months after the de facto end announced by the Korean public health authority (July 28, 2015) as well as right after the

formal end of the MERS outbreak, based on the WHO guideline (December 23, 2015). A total of 900 adults aged of 20 to 69 and were living in Seoul city and Gyeonggi-do in South Korea participated. The area was selected concerning that the 84.9% of MERS cases occurred in the specific areas (Korean Medical Association, 2016).

Korea Research, a professional survey agency, sampled the 900 participants to present the areas by age, gender, and residence. Ten experienced interviewers were trained in advance specifically for this survey, and subsequently administrated the survey in face-to-face. Household items worth about USD 2 were provided to the participants who agreed to and completed the survey. Descriptions of the participants are in Table 17.

Table 17. Description of participants

Demographics	*N*(%)	*M*(*SD*)
Total	900(100)	
Age		44.9(14.74)
20s	172(19.1)	
30s	179(19.9)	
40s	196(21.8)	
50s	176(19.6)	
60s+	177(19.7)	
Gender		
Male	446(49.6)	
Female	454(50.4)	
Education		
Less than elementary	28(3.1)	
Middle school	51(5.7)	
High school	390(43.3)	
College	410(45.6)	
Graduate school+	21(2.3)	
Income		
Less than USD 1000	43(4.8)	
USD 1,000−3,000	244(27.1)	
USD 3,000−4,000	427(47.4)	
USD 5,000−6,000	134(14.9)	
USD 7000+	51(5.7)	
No answer	1(0.1)	
Type of employment		
Regular	557(61.9)	
Temporal	61(6.8)	
Day worker	11(1.2)	
No answer	271(30.1)	

6.3.2. Measurement

6.3.2.1. Emotion

In a previous national field experiment, the participants' fear and anger that naturally occurred due to the 9/11 terrorist attack were measured using validated scales after 9 to 23 days after the attack (Lerner et al., 2003). Taking into account the substantial time gap between the measurement of emotion in this study and the de facto end of the outbreak, the study intended to reduce the risk of recall bias. Thus, a dichotomous question (*yes*[1], *no*[0]) was utilized rather than using detailed scales: "Please check the emotions you have experienced during the MERS outbreak." The option of anger, fear, and anxiety were presented with allowance of multiple choices.

6.3.2.2. Appraisal of non-dailiness

The reference for the measurement of non-dailiness of the general public who were indirectly influenced by an outbreak was limited. There could be a number of non-daily events in an outbreak and which events were representative for non-dailiness did not achieve consent. Previously, Lee et al. (2016) used multiple items to measure the impact of an outbreak on the public's daily life. The items included whether the participants experienced the setback of personal plans (travelling and vacation) and whether the income was decreased due to the outbreak. In this study, however, the main concern is how the general perception of the public on non-dailiness affect emotions. Therefore, they study used a single question to ask the degree of the overall change in the daily life: "How much did your daily life differ

because of the MERS outbreak? A score 100 means that the daily life was same as before the outbreak and a score 0 means that there were a contraction in your daily activities. Please select a score from 0 to 100." Another question was supplemented for those who experienced non-dailiness (score of less than 100) to ask for time taken to recover their daily life before the outbreak: "Is your daily life recovered to the same level as it was before the MERS outbreak? How much time was taken to achieve full recovery?" Six response options from a short to long period of time were provided for answer (1=*less than a month*; 6=*more than 5 months or not recovered yet*). Later, the options were categorized into three for analysis.

6.3.2.3. Protective behaviors in an outbreak

A wide spectrum of protective behaviors which the public usually adopts in health-related crises were reviewed, and the most frequently observed ones were selected for this study: "adherence to the recommendation," "self-mitigation," and "information seeking." The first two were defined as behaviors of avoidance while the last as behaviors of approach.

Adherence to the recommendation It is a standard method recommended by the CDC wherein individuals can effectively avoid infectious disease risk. For the proven usefulness, the recommendation is frequently one of the main concerns of public communication in an outbreak (Bults et al., 2011; Quah & Hin-Peng, 2004; Rubin et al., 2009). In this study, two recommendations, washing hands and wearing masks were used: "I washed my hands and used sanitizer" and "I always wore masks." Referring a previous survey (Brug et al., 2004), participants were instructed

to answer with *yes*[1] or *no*[0].

Self-mitigation Self-mitigation, which is not recommended by the public health authority, is one of the public's common responses in various types of disasters (Burn & Slovic, 2012). It includes the avoidance of a certain kind of people, places, and activities suspected to have access to the risk. In an outbreak, avoidance of people such as hospital workers and their families, places such as hospitals, public transport, and crowded places, and the activities such as eating out and travelling are often observed among the public (Bults et al., 2011; Lau et al., 2010; Rosoff, John, & Prager; 2012; Rubin et al., 2009; Sadique et al., 2007). Among the various unrecommended behaviors, three items that represented the avoidance of a certain activity, place, and people, respectively, were selected for measurement: "I cancelled appointments and avoided going out," "I avoided going to the hospital even when I was sick," and "I avoided hospital workers." Participants were instructed to answer with *yes*[1] or *no*[0].

Information-seeking Information seeking is likely to be elicited in an outbreak either by information insufficiency about the unknown disease or more simply by negative feelings created by the situation (Yang & Kahlor, 2013) Such information seeking in health-threatening situation is regarded as one of the positive coping behaviors that can increase predictability and sense of control (Andreassen, Randers, Naslund, Stockeld, & Mattiasson, 2005; Case, Andrews, Johnson, & Allard, 2005) and also promote better decision making (Loiselle, 1995; Rees & Bath, 2001). This implies that people become more engaged and aware of the health risk by concentrating their attention and resource to information-seeking (Livneh, 2000; Rees &

Bath, 2001; Shiloh, Sinai, & Keinan, 1999). In this sense, information seeking in an outbreak can be viewed as a behavior of approach. Referring to a study on information behaviors during an outbreak (van Velsen, van Gemert-Pijnen, Beaujean, Wentzel, & van Steenbergen, 2012), two items of active and passive information seeking were used for measurement: "I called health-related facilities to ask about MERS," and "I talked about MERS with others." Participants were instructed to answer with *yes*[1] or *no*[0].

6.3.2.4. Risk perception after an outbreak

To address the public perception with regard to an outbreak, the perceived risk of an infectious disease was adopted. The perception of risk is generally regarded to have two components: "probability of occurrence" of the adverse event and "seriousness of the consequence" (Yeung & Morris, 2001). Following this, risk perception was measured using two questions: "How much do you think you will be infected with MERS in five years?" and "How seriously do you think you will be sick when infected with MERS?" The 5-point Likert scale (1=*very unlikely/not seriously*; 5=*very likely/seriously*) was used by referring to a previous study (Brug et al., 2004).

6.3.3. Analysis

The experience of fear, anger, anxiety by the public in an infectious disease outbreak was investigated. The frequencies of those who experienced each emotion were analyzed and also, the differences by sociodemographic factors (age, gender, education, income, and type of employment) was

examined using *F*–test or chi–square test. To examine the effect of the appraisal of non–dailiness on the formation of the emotions, chi–square test and *F*–test were also used, depending on the specific concern—the perception on whether non–dailiness was experienced or how much experienced.

For the purpose of identifying the effect of the emotions, the regression approach was adopted. The effect of the emotions on the public's protective behaviors during an outbreak was tested using a logistic regression model, while the effect on the public's risk perception after an outbreak was tested using a linear regression model. The sociodemographic factors (age, gender) were used as control variables in both analyses.

Lastly, the interaction between sociodemographic factors and the emotions was examined using an hierarchical regression model. In the first–level model, sociodemographic factors and the emotions were included, and in the second–level model, the terms representing the interaction were additionally included. The likelihood–ration test was performed to examine whether there was improvement from the first–level to second–level model in explaining the public's perception and behaviors. When there was no difference, it was interpreted that the interaction was unnecessary to be considered.

6.4. Results

6.4.1. Descriptive statistics

Among the 900 participants, the majority of the participants reported to experience anxiety (73.2%, *n*=659) in the outbreak. Fear was experienced by 34.6% (*n*=311), while anger was by 23.7% (*n*=213).

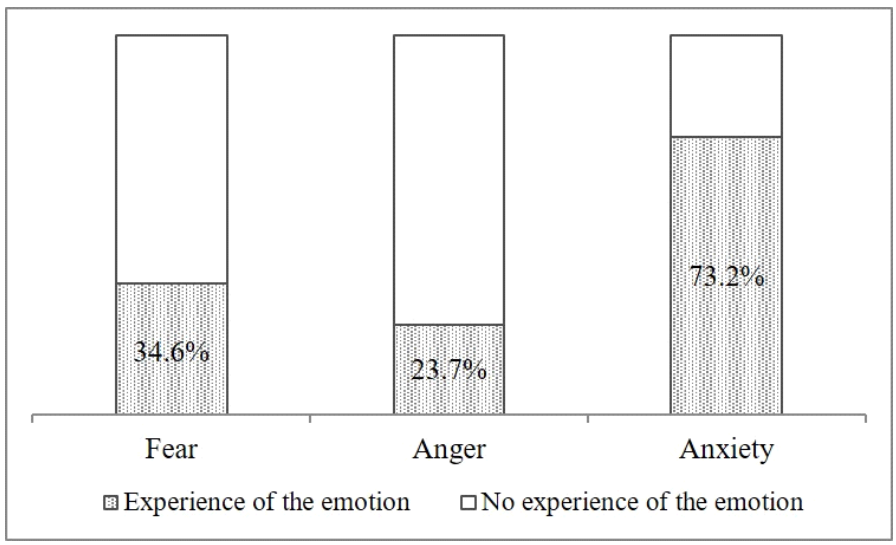

Figure 10. Emotions of the public

The 38.9% (*n*=350) of the participants reported the daily life score during the outbreak as less than 100, which meant that they perceived their daily life was disrupted by the outbreak. Among those who reported the non-dailiness, 13.4% (*n*=47) reported a score of 0-30, indicating a high level of non-dailiness; 38.3% (*n*=134) reported a score of 40-60, indicating a medium level; and 48.3% (*n*=169) reported a score of 70-90 score, indicating a low level. Also, with regard to the time to recover to daily life before the outbreak, 28.3% (*n*=99) reported less than 1 month, which indicated quick recovery; 62.0% (*n*=217) reported 1-3 months, which indicated a medium rapidity; and 9.7% (*n*=34) reported 3 months or more, which indicated delayed recovery.

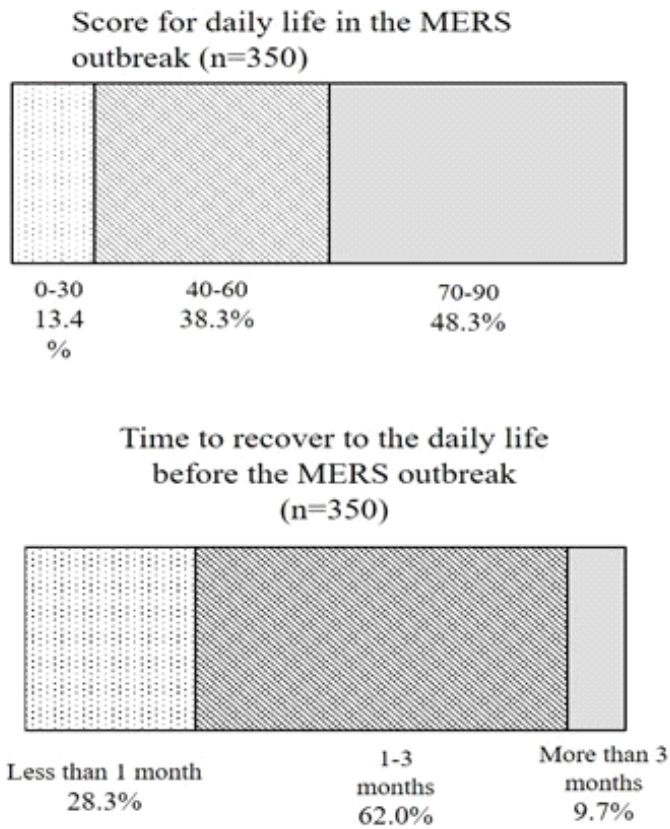

Figure 11. Appraisal of non-dailiness of the public

In terms of protective behaviors, variations within, as well as between the categories were, observed. Within "adherence to the recommendation," 87.8% (*n*=790) of the participants conducted washing hands while only 35.3% (*n*=318) wore masks. In "self-mitigation", avoiding going out was higher (53.4%, *n*=481) than avoiding going to the hospital even when sick (33.3%, *n*=300), and avoiding hospital workers (19.2%, *n*=173). In "information seeking," discrepancy between active one (calling health-related facilities: 15.2%, *n*=137) and passive one (talking about MERS with others: 89.7%,

n=807) was presented. By frequency, washing hands and talking with others about MERS were the most conducted protective behaviors during the outbreak.

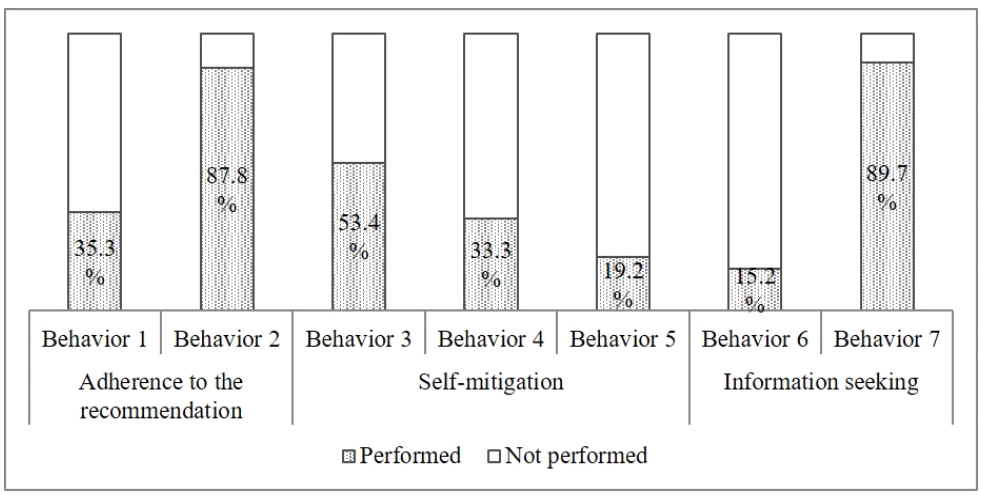

Figure 12. Protective behaviors of the public

Note. Behavior 1: Wearing masks, 2: Washing hands, 3: Avoiding going outside, 4: Avoiding going to the hospital even when sick, 5: Avoiding hospital workers 6: Calling health-related facilities to ask about MERS, 7: Talking about MERS with others

With regard to how participants perceived risk related to the infectious disease after the outbreak was presented difference between the two components. The participants perceived the possibility of getting infected (the possibility of the occurrence) lower than the mid-point '3' (*M*=1.88, *SD*=0.91), while how seriously sick when infected (the seriousness of the consequence) was higher than the mid-point (*M*=3.86, *SD*=1.18). That is, people thought that they were unlikely to get infected with MERS but once

they did, they got sick severely.

6.4.2. Emotions by sociodemographic factors

How the experience of the emotions differed by the sociodemographic factors was investigated. The difference by age, education, and income was tested using F-test and the difference by gender and type of employment was tested using chi-square test. As the result, the experience of fear differed by gender: fear was more experienced by the female group, $\chi^2(1)=9.61$, $p<0.01$.

Table 18. Fear experience by sociodemographic factors

	$M(SD)$ or $n(\%)$		F/χ^2
	Without experience of fear	With experience of fear	
Age	44.69(14.90)	45.38(14.46)	0.44
Gender			
Male	314(70.4)	132(29.6)	**9.61****
Female	275(60.6)	179(39.4)	
Education	3.38(0.75)	3.38(0.77)	0.00
Income	1.91(0.92)	1.87(0.90)	0.43
Employment type			
Regular	363(65.2)	194(34.8)	0.91
Non-regular	51(70.8)	21(29.2)	

Note. Non-regular: temporal and daily worker;
Education level: 1(*less than elementary*) to 5(*graduate school+*),
Income level: 1(*less than USD 1,000*) to 5(*less than USD 7,000*);
*$p<0.05$; **$p<0.01$

The experience of anxiety differed by age: those who experienced anxiety was older than those who experienced anxiety, $F(1, 898)=5.14$, $p<0.05$.

Table 19. Anxiety experience by sociodemographic factors

	M(*SD*) or *n*(%)		F/χ^2
	Without experience of fear	With experience of fear	
Age	43.09(15.27)	45.60(14.50)	**5.14***
Gender			
Male	126(28.3)	320(71.7)	0.98
Female	115(25.3)	339(74.7)	
Education	3.49(0.78)	3.38(0.76)	0.00
Income	1.91(1.01)	1.89(0.87)	0.12
Employment type			
Regular	144(25.9)	413(74.1)	3.40
Non-regular	26(36.1)	46(63.9)	

Note. Non-regular: temporal and daily worker;
Education level: 1(*less than elementary*) to 5(*graduate school+*),
Income level: 1(*less than USD 1,000*) to 5(*less than USD 7,000*);
$^{*}p<0.05$; $^{**}p<0.01$

None of the sociodemographic factors affected the experience of anger.

Table 20. Anger experience by sociodemographic factors

	M(*SD*) or *n*(%)		F/χ^2
	Without experience of fear	With experience of fear	
Age	44.88(14.91)	45.08(14.20)	0.03
Gender			
Male	337(75.6)	109(24.4)	0.29
Female	350(77.1)	104(22.9)	
Education	3.37(0.77)	3.44(0.74)	1.61
Income	1.89(0.91)	1.91(0.93)	0.20
Employment type			
Regular	426(76.5)	131(23.5)	0.96
Non-regular	59(81.9)	13(18.1)	

Note. Non-regular: temporal and daily worker;
Education level: 1(*less than elementary*) to 5(*graduate school+*),
Income level: 1(*less than USD 1,000*) to 5(*less than USD 7,000*);
$^{*}p<0.05$; $^{**}p<0.01$

6.4.3. Association of the appraisal of non-dailiness and the emotions

The association of the appraisal of non-dailiness and the emotional experience was investigated. The perception on whether there was non-dailiness or not (daily life score 100 vs. less than 100) associated with the experience of emotions was examined using chi-squared test. In the results presented, all three emotions were more experienced in among those who perceived non-dailiness than those who did not perceived non-dailiness (fear: 39.0% vs. 31.7%; anger: 27.4% vs. 21.2%; anxiety: 76.6% vs. 71.1%). The results were significant in fear and anger, $\chi^2(1)=5.06$, $\chi^2(1)=4.50$, respectively, $p<0.05$.

For those who reported on non-dailiness (n=350), whether the higher

score of non-dailiness was related to the emotions was examined using *F*-test. As results, In all three emotions, the score tended to be higher in those who experienced the emotions (fear: 61.46 [*SD*=18.37] vs. 60.09 [*SD*=19.43]; anger: 61.77 [*SD*=18.30 vs. 60.20 [*SD*=19.28]; anxiety 61.48 [*SD*=19.53] vs. 57.75 [*SD*=16.91]]. However, the results failed to find significant difference in all three emotions, $F(1, 348)=0.43, 0.48, 2.39$, respectively, in the order of fear, anger, and anxiety, $p \geq 0.05$.

6.4.4. The effect of emotions on protective behaviors and risk perception

The direct effect of emotion on the public's protective behaviors in an outbreak and the risk perception after an outbreak was investigated using a regression model. The multicollinearity among the independent variables was tested using the variation inflation factor (VIF) index. As the value of VIF did not exceed 10, there was no evidence of multicollinearity.

Table 21. Result of multicollinearity test

Variable	VIF	1/VIF
Age	1.04	0.958596
Female	1.03	0.972015
Fear	1.01	0.986076
Anger	1.01	0.989657
Anxiety	1.01	0.991606
Mean VIF	1.02	

The result of logistic regression analyses on the effect of the emotions on the protective behaviors in an outbreak (RQ2) presented that emotions

generally increased the behaviors. In order words, those who experienced the emotions were more likely to adopt protective behaviors than those who did not experience emotions. Nevertheless, the influence of each emotion presented differences according to whether those behaviors were of approach or avoidance.

Fear raised the behaviors of avoidance. Specifically, "the adherence to the recommendation" (washing hands: OR=1.73, p<0.001; wearing masks: OR=2.21, p<0.01) and "self-mitigation" (avoiding going out: OR=1.61, p<0.01; avoiding going to the hospital even when sick: OR=1.40, p<0.05) were increased. Anxiety also raised the behaviors of avoidance. Similar to fear, "adherence to the recommendation" (washing hands: OR=1.45, p<0.05; wearing masks: OR=1.63, p<0.05) and "self-mitigation" (avoiding going out: OR=1.62, p<0.01) were increased. However, both fear and anxiety were unrelated to the behavior of approach—information seeking. Thereby, H2-1 was supported.

Anger also increased behaviors of avoidance—"adherence to the recommendation" (washing hands: OR=1.86, p<0.05) and "self-mitigation" (avoiding going outside: OR=1.93, p<0.001, avoiding going to the hospital even when sick: OR=2.11, p<0.001). Distinctively, the behavior of avoidance —information seeking—was also raised by anger (calling health-related facilities: OR=1.80, p<0.01; talking with others: OR=1.90, p<0.05). Therefore, regarding RQ2-1, anger increased protective behaviors of avoidance as well as approach.

Table 22. Effect of emotions on the protective behaviors in an outbreak

	Behaviors of avoidance					Behaviors of approach	
	Adherence to the recommendation		Self-mitigation			Information seeking	
	Behavior1 (OR)	Behavior2 (OR)	Behavior3 (OR)	Behavior4 (OR)	Behavior5 (OR)	Behavior6 (OR)	Behavior7 (OR)
Age	**0.99***	1.00	**1.01****	1.01	1.00	1.01	1.00
Female	**1.87****	**1.98****	**1.89****	**1.45***	**1.59****	1.00	**2.26****
Fear	**1.73****	**2.21****	**1.61****	**1.40***	**1.59****	1.45	0.91
Anger	1.31	**1.86***	**1.93****	**2.11****	1.29	**1.80****	**1.90***
Anxiety	**1.45***	**1.63***	**1.62****	1.22	1.47	0.98	1.17
R(%)	4.4%	5.5%	6.0%	3.7%	2.8%	1.8%	3.0%

Note. OR: Odds ratio, Behavior 1: Wearing masks, 2: Washing hands, 3: Avoiding going outside, 4: Avoiding going to the hospital even when sick, 5: Avoiding hospital workers 6: Calling health-related facilities to ask about MERS, 7: Talking about MERS with others; Perception 1: Possibility of the occurrence, 2: Seriousness of the consequence; $^{*}p<0.05$; $^{**}p<0.01$

Regarding the effect of emotions on public's risk perception after an outbreak, the emotions did not influence either on “possibility of occurrence” or “the seriousness of the consequence.” Thereby, H2−1 and H2−2 were not supported.

Table 23. Effect of emotions on the risk perception after an outbreak

	Possibility of the occurrence (β)	Seriousness of the consequence (β)
Age	**0.11****	**0.08***
Female	0.03	0.06
Anger	0.06	0.06
Fear	0.06	–0.06
R(%)	0.02	0.06

Note. Values are standardized coefficient
*p<0.05; **p<0.01

6.4.5. Interaction between emotions and sociodemographic factors

The interaction between emotions and sociodemographic factors (age and gender) was investigated using an hierarchical regression model (RQ3). As a results, the interactive effects were observed in several behaviors of avoidance: fear and gender presented interactive effects on wearing masks (OR=0.46, p<0.05) and avoiding going outside (OR=0.43, p<0.05); anger and age group (age<65 versus age≥65) on explaining washing hands (OR=1.78, p<0.01).

However, the likelihood ratio test on the models with and without interaction terms produced insignificant results, $\chi^2(6)$=11.18, 9.11, 10.79, in

the order of wearing masks, washing hands, and avoiding going outside, $p<0.05$. In other words, there was no evidence that indicated interaction between emotions and sociodemographic factors in explaining the public's protective behaviors in an outbreak. Also, the interaction was not observed in explaining the public's risk perception after an outbreak as well.

6.5. Discussion

In Study 3, how emotions (fear, anger, anxiety) of the public are affected by the appraisal of non–dailiness in an outbreak was investigated. Further, the effects of the emotions on risk perception after an outbreak as well as protective behaviors during an outbreak were investigated. The two theoretical frameworks of action tendency and appraisal tendency were adopted for the investigation, with the focus on how the effects differ by the emotions.

Consistent with previous studies, this study found fear (34.6%), anger (23.7%), and anxiety (73.2%) experienced by the public in the MERS outbreak. Nevertheless, it is noticeable that the anxiety experience is particularly prominent. The possibly explanation is that the public's distrust towards the public health authority—a well–known explanatory factor of anxiety in public health crises (Cho, 2009; Lee, 2009; Park & Sohn, 2010)—increased anxiety. The trust of South Koreans on the government has been continuously undermined as they witnessed managerial failures in responding recent social disasters including the MERS outbreak. A survey conducted right after the de facto end of the outbreak (20 July, 2015) corroborated it where only 28.2% and 24.9% of the participants presented

trust on the government and the public authority, respectively (Lee, et al., 2016). Such distrust also led the public to rely on the informal source of information (e.g., SNS) which sometimes exaggerated the situation and thus, created more anxiety in the outbreak (Kim, 2015).

The creation of the emotions, in particular—fear and anger—by the appraisal on whether there were non-dailiness during an outbreak were verified in this study (RQ1). However, the degree of non–dailiness was not influential on any of the emotions, which was inconsistent with a previous study (Lee et al., 2016). The inconsistence is believed to be due to the use of different measurement. The statements used in Lee et al. (2016) connoted emotional experience as well as non–dailiness (e.g., "worried of getting infected restricted me from going out") This study, in contrast, attempted to evaluate the non-dailiness without implying induced emotions. Future research on the consented measurement of the non–dailiness of the general public in an outbreak is needed.

The investigation on the effect of the emotions on protective behaviors of the public during an outbreak (RQ2) yielded substantial influences on the emotions in inducing the behaviors. Specifically in the behaviors of avoidance ("adherence to the recommendation" and "self–mitigation"), all three emotions were positively associated. As described, anger is originally known to activate behaviors of approach; possibly shifts role to activate behaviors of avoidance when it is rewarding. Therefore, from the study result, it is revealed that people perceive that behaviors—such as "adherence to the recommendation" and "self–mitigation" to avoid disease risks—to provide clear benefits of healthy life.

In terms of behaviors of avoidance, it is noteworthy that fear was more engaged in those behaviors than the other two, in that every five behaviors were raised by fear. Especially, the avoidance of the hospital workers was raised only by fear. Such relation between fear and an unwarranted level of avoidance of hospital workers—stigmatization—was previously suggested by the studies on the SARS outbreak as well (Des Jarlais, Galea, Tracy, Tross, & Vlahov, 2006; Chang, Huang, Lee, Hsu, Hsieh, & Chou, 2004).

The interesting discrepancy among the effect of emotions was found in the behaviors of approach. "Information seeking" was increased only by anger not fear or anxiety. Obviously, information seeking provided rewards to angry people as it supported them to be more equipped in protecting their health in an outbreak. Furthermore, a more direct benefit of information seeking was suggested by previous studies on the relation between emotions and information use regarding risk. While fear was associated with the avoidance of risk information (Des Janis, 1967; Witter, 1994), anger was associated with collecting more information to reassure control over risk (Griffin et al., 2008). In other words, information seeking can provide a sense of controllability in an outbreak to angry people.

The effect of the emotions on the risk perception after an outbreak, however, was not verified in this study. This is inconsistent with the previous study (Lerner et al., 2003), where the opposite role of fear and anger on risk perception was confirmed. The possible reason for the inconsistency is, in this study, risk perception was measured after five months of the de facto end of the outbreak, while the previous study measured it after six to ten weeks later of the attack. Therefore, substantial

time gap between actual emotional experience and perception might reduce the effect of emotions, which should be considered in future studies. In addition, since the interaction between emotions and sociodemographic factors (age and gender) was not presented in the current study (RQ3), it is also needed more research designed specifically for exploring interaction in the future.

A few limitations are addressed in this study. First of all, the investigation was retrospectively conducted; therefore, the risk perception during the outbreak—which would have been highly useful to understand the construction of emotions in an outbreak—was unable to be measured because asking for recall in past perception would be highly inappropriate. In addition, some level of risk of recall bias accompanied by retrospective investigate is expected. In regard with measurement, several variables were measured using a single question or the statements developed in this study. Lastly, issues on the generalization be expected because the sample was created from two regions in South Korea.

7. Conclusion

7.1. Implications

7.1.1. Theoretical implications

This dissertation focused on the emotions of people under the influence of a disaster by an infectious disease outbreak. Specifically, emotions of hospital workers and the public, stressors behind the emotions, and the effect of the emotions on cognitive appraisal, social behaviors, and functioning were investigated. As results of the investigations, the theoretical implications were drawn as follows.

First, the dissertation expanded the understanding of emotions of people under the influence of an outbreak by adopting more emotions than previous studies. As reviewed, certain types of emotions have been continuously highlighted in an outbreak situation—for example, fear, anxiety, and stress of hospital workers (Chan et al., 2005; Lin et al., 2007; Maunder et al., 2006; McAlonan et al., 2007) and fear and anxiety of the public (Bults et al., 2011; Lau et al., 2003; Lau et al., 2010; Leung et al., 2004; Liao et al., 2010; Rubin et al., 2009). By adopting more emotions into the investigation, more comprehensive view on the emotional experience of people during an outbreak were provided.

Second, this dissertation contributed to the specification of the effect of emotions on the resilience of hospital workers. Even though emotions and resilience are closely related, the relation has not been actively explored in both side of the research area. That was, the negative emotions of hospital workers during an outbreak was examined in terms of how they were

simply related to health outcomes (Chan et al., 2005; Maunder et al., 2004; Maunder et al., 2006; McAlonan et al., 2007), while the research of resilience did not fully recognize emotional experience in an outbreak as a considerable factor for resilience after an outbreak. Instead, the discussion on emotions has been sort of biased to the positive ones as a strategic element to promote resilience (McAllister & McKinnon, 2009; Pipe et al., 2011). As this dissertation posited emotional experience in the process of resilience based on theories, the effect of emotions of hospital workers during an outbreak was specified on their afterwards resilience.

Third, this dissertation specified the different roles of discrete emotions on perception and behaviors of the public with regard to an outbreak. Previously, the effect of public's emotions on protective behaviors were tested (Bults et al., 2011; Lau et al., 2003; 2010; Leung et al., 2004; Liao et al., 2010; Rubin et al., 2009); however, the behaviors were listed and used without proper division to examine the different effects among emotions. In this dissertation, behaviors were categorized referring a psychological framework and thus, the different roles of emotions on the behaviors were defined.

7.1.2. Practical implications on disaster management

Practical implications in the perspective of public health were drawn separately by the key group—hospital workers and the public—as the studies on hospital workers (Study 1 and 2) provided implications for human resource management, while the study on the public (Study 3) provided implications for the communication in an outbreak.

Regarding the management of hospital workers there should be two approaches. First is building the emotional capacity of hospital workers to reduce emotional disruption during an outbreak and facilitate resilience after an outbreak. Borrowing the insights from the management of organizational crises, the workers' emotional capacity and sensitivity is one of the critical areas for effective management of difficult situations (Mitroff, 2005). There has been efforts to provide supports for the resilience of hospital workers, however; they tended to have the restricted focus on the elements such as hardiness, self-efficacy, a sense of hope, and optimism (Hart et al., 2014). As this dissertation found in Study 1, such approach might have limitations in facing an infectious disease outbreak.

In how to build emotional capacity, the concept of emotional intelligent (EI)[5] and the strategies of building it can be adapted. EI proved to not only reduce psychological distress and emotional labor burden (Hu, 2012) but also improve task performance and organizational citizenship (Yuan, Hsu, Shieh, & Li, 2012) in general organizational settings. The comprehensive strategic approach on emotion of building EI would decrease

5) Defined as "a set of interrelated skills concerning the ability to perceive accurately, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thought; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth" (Mayer & Salovey, 1997, p.10), emotional intelligence (EI) encompasses dimensions of emotional capacity: self-emotional appraisal (the ability to understand their deep emotions and be able to express these emotions naturally.); others' emotional appraisal (the ability to perceive and understand the emotions of those around them); the regulation of emotion in the self (ability to regulate their own emotions, thus enabling more rapid recovery from psychological distress); the use of emotion to facilitate performance (the ability to use emotions by directing them toward constructive activities and personal performance) (Yuan, et al., 2012).

the emotional disruption of the hospital workers in an outbreak and increase the resilience after an outbreak.

While the first implication is to facilitate the capacity of hospital workers, the second implication is to construct the protective environment for them. The protective environment resilience research means less risk factors and more protective factors (Kumpfer, 1999). In this dissertation, the triggers behind negative emotions and stress were identified in Study 2 as stressors that undermine the emotional responses of hospital workers in an outbreak, and thus, should be mitigated by managerial efforts. Since the identified stressors encompass the issues from multiple–level, such efforts for providing protective environment to hospital workers might include coordination and cooperation among the hospital organization, the community, and the local government.

The last practical implication is for communication with the public in an outbreak. Based on the evidence from Study 3, while timely and accurate information for accurate preventive measures are found effective, this dissertation further proposes an emotion–tailored message to promote the public's healthy behaviors in an outbreak. Since the behaviors are differently affected by discrete emotions, public authority should quickly diagnose what prominent emotions the public is experiencing once an outbreak occurs. The diagnosis can be efficiently performed by monitoring SNS comments. After defining emotions in concern, messages should be tailored by the emotions. For example, for those who mostly feel fear use of reliving tone (e.g., “hand wash will keep you and your family safe from the disease”) is suggested, as their protective behaviors can go beyond the recommended

preventive measures to the unwarranted self-mitigation (e.g., stigmatization on the hospital workers). On the other hands, for those who mostly feel anger, scientific evidences that present how the measures are beneficial for one's health can be effective (e.g., 'hand wash will reduce 40% of being infected'), as angry they are affected by the presence of rewards.

Recently, the issue regarding promoting resilience from the impact of disasters through communicating emotions is raised in the Korean society, thus additional information are provided in this dissertation as follows. Communicating emotions is different from communicating emotionally: The former is to let others know about one's emotion, as emotion itself is the content of the message. Communicating emotionally is to use emotion as property of the message through non-verbal expressions (e.g., tones and facial expressions) (Planalp, 1999).

Knowingly expressing one's emotions (i.e., communicating emotions) is regarded as a critical method for psychotherapeutics because it leads to emotional recovery (Zech & Rimé, 2005). While the empirical data of the research area to clarify mechanism is so far insufficient, this dissertation argues, through communication, the capacity of self-emotional appraisal as a part of emotional intelligence might be enhanced. As mentioned, such capacity is promising to facilitate the healthy process of emotions.

There are also accumulated evidences on how to effectively provide emotional support to others that can be used as reference in interpersonal communication. According to Burleson (2003) where the evidences are integrated, the following are proposed: (a) have positive helper intent, feeling, and commitment; (b) acknowledge, comprehend, and understand a

person's feelings and situation; (c) legitimize a person's emotions (and sometimes actions); (d) encourage a person to talk about and elaborate on problematic situations and feelings. The research on communicating emotions and providing emotional support by communication can be adopted to support high-risk groups of emotional distress in disasters (e.g., victims and frontline rescuers, including hospital workers) through an interpersonal manner.

In public communication during a disaster, emotions also should be addressed. Most of all, the public authorities should recognize and legitimize the public's emotions (CDC, 2015), and convey such recognition by expressing enough sympathy using tactics of communicating emotions or emotionally when applicable. Decision-making to reduce or mitigate the public's emotional distress should follow after then. A system to effectively deliver the service of the available interpersonal emotional supports to high-risk groups can be one of such. Furthermore, strategic utilization of the public's emotions also should be taken into consideration for effective disaster management as suggested by the evidences of this dissertation.

7.2. Limitations and future directions

Limitations of this dissertation are declared and future directions derived from the limitations are proposed as follows. First, people's emotions in a disaster differs by the disaster cycle. For example, in the "pre-disaster phase" and the "impact phase", the extensive negative emotions such as fear, panic, hysteria, and confusion are experienced. In the "honeymoon phase" where the supports from the government, volunteers, and community

are raised, feeling of a sense of optimism can be experienced. In the "disillusionment phase" where the limits of the supports are recognized, anger, anxiety, and frustration are experienced (Dewolfe, 2000). Even though the phases are described mainly focusing the emotions of directly-affected victims, the proposed difference of emotions by phase cycle gives an important implication to consider the disaster cycle in investigating disaster-induced emotions. As it has not been fully considered in this dissertation, there is a need for future studies on the emotions experienced in different phases of a disaster.

Second, the investigation on the effect of emotions is necessary to be more extended. The effect of emotions on the hospital workers' perception and behaviors should be investigated, as those are possibly mediate the emotions and resilience in an outbreak. The concept of "coping" can be adopted to explore the effect of emotions on behaviors in specific. Also, the effect of emotions on the resilience of the public should be investigated. This is because, even though the impact of an outbreak on the general public are usually indirect through the media, it is enough to undermine the resilience of the public (Cho, Chang, Ryu, & Rie, 2015).

Third, it would have been more beneficial to specify the vulnerable group of people in experiencing emotional distress. For the purpose, various influential factors on emotions should have been thoroughly examined whether they can define the vulnerability. This dissertation attempted to examine some occupational factors of hospital workers as well as sociodemographic factors of the public; however, failed to find any factors that consistently highten negative emotions. Thereby, there is a need to

specify vulnerability in an outbreak in the future studies with more sophisticated design for the purpose.

Limitations specific to each study are described in the discussion part of each study. Those are, in brief, some of the measurements were developed due to a lack in previously validated tools; the data of hospital workers were collected at one hospital and therefore, it takes caution to generalize the implications; and lastly, all surveys were retrospectively conducted that were subject to some risk of recall bias.

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Appendix

Survey questionnaire of the Study 1

https://drive.google.com/file/d/0BwH6_j6xZ_OPbzBSenFMcExTVGs/view?usp=sharing

Survey questionnaire of the Study 3

https://drive.google.com/file/d/0BwH6_j6xZ_OPcU1kWlMxRzVhcWs/view?usp=sharing

Notification: Use of the survey questionnaires requires permission from all the researchers involved

국문초록

2015년에 한국에서 발생한 메르스 유행은 상당한 인적 피해를 수반한 사회적 재난이었다. 유행 중 많은 수가 메르스에 감염되고 일부 사망하였으며 이로 인해 한국 사회는 높은 수준의 정서적 고통을 겪었다. 이 같은 상황에서 체계적이고 적극적인 정서적 지지가 필요하였으나, 실제 보건당국과 중앙정부의 메르스 유행 대응에 있어 사람들의 정서적 위기와 회복은 중요하게 고려되지 않았다.

본 논문은 감염병 유행 중 정서적 지지에 대한 국민적 필요와 정책 간의 간극을 줄이고자 하는 시도로서, 감염병 유행 중 국민들의 정서적 경험과 그러한 정서적 경험이 사람들의 인지, 행동, 사회적 기능 유지에 미치는 영향에 대한 근거를 제공하고자 한다. 그리고 이를 기반으로 감염병 유행으로 인한 재난 관리에 대한 함의점을 도출하고자 한다. 마지막으로 향후 연구에 대한 방향성을 제시하고자 한다. 연구 목표를 위해 3개의 세부 연구가 설계되었으며 두 주요 집단인 병원근로자와 공중을 대상으로 연구를 하였다. 세부 연구 1과 2는 병원근로자에 대한 연구, 세부 연구 3은 공중에 대한 연구이다.

세부 연구 1에서는 메르스 유행 중 병원근로자의 부정적인 정서적 경험과 그 같은 경험이 유행 후의 사회적 기능 유지에 미치는 영향을 양적 연구 방법을 이용하여 조사하였다. 조사를 위해 회복탄력성(resilience) 개념과 모델이 도입되었다. 조사 결과, 높은 수준의 부정적인 정서적 경험은 메르스 유행 이후 회복탄력성 지표로서의 외상후스트레스장애 가능성을 높이는 한편, 다음 감염병 유행 때 근무 의사를 낮췄다. 또한 부정적인 정서적 경험은 다른 요인들(위험 인식, 자원)이 회복탄력성에 미치는 영향을 매개하는 것으로 확인되었다.

세부 연구 2에서는 메르스 유행 중 병원근로자의 정서에 대한 조사를 심화하였다. 이 연구에서는 다양한 종류의 정서와 정서를 촉발하는 사건 경험들이 질적연구 방법에 따라 조사되었다. 조사 결과, 분노, 불안, 공포, 슬픔, 혐오, 부끄러움/죄책감, 다양한 부정적 정서가 관찰되었고 정서를 촉발한 사건 경험에 대해서는 네 가지 주제가 도출되어 촉발된 감정과 매치되었다. 구체적으로, 불안, 공포, 슬픔은 '안전하지 않은 근로환경'에 의해 촉발되었고, 분노와 슬픔은 '나와 내 가족들에 대한 낙인', 분노, 불안, 혐오, 슬픔, 부끄러움/죄책감, 스트레스는 '소통 실패와 인한 실수, 누락, 지연', 슬픔과 스트레스는 '불신과 응답성 상실에 대한 비난'에 의해 촉발되었다.

세부 연구 3은 메르스 유행 중 일반 공중의 정서적 경험과 그와 같은 경험이 유행 중 보호 행동(protective behavior) 수행과 유행 후 위험 인식에 미치는 영향을 양적 연구방법을 사용하여 조사하였다. 공포, 분노, 불안 경험에 초점을 맞추었으며, 심리학 이론에 기반을 두고 경험하는 각 정서가 행동과 위험 인식에 미치는 영향을 분석하였다. 분석 결과, 회피 경향의 보호 행동은 모든 정서에 의해서 증가된 반면 접근 경향의 보호 행동은 분노에 의해서만 증가되어, 정서 종류에 따른 상이한 영향이 확인되었다. 유행 후 위험 인식은 정서에 영향을 받지 않았다.

본 논문은 보다 다양한 정서를 도입함으로써 감염병 유행으로 인한 재난 상황에서의 정서적 경험에 대한 이해의 폭을 넓혔다. 또한 회복탄력성 개념과 모델에 기반을 두고 감염병 유행 중 병원근로자들의 부정적인 정서적 경험의 영향력이 유행 후 사회적 기능 유지에 미치는 영향을 밝혔다. 마지막으로, 심리학적 이론에 기반을 두고 감염병 유행 중 공중의 정서적 경험이 유행 중 보호적 행동 수행에 미치는 영향 밝히는 한편, 경험하는 정서 종류별로 이 같은 영향력에 차이가 있음을 밝혔다.

본 논문의 결과는 감염병 유행으로 인한 사회적 재난 관리를 보다 효과적으로 수행하기 위한 실증적 함의를 제시한다. 병원근로자들에 있어서는 인적자원관리(human resource management)의 측면에서 함의점이 도출되었다. 첫째, 병원근로자들의 정서적 역량(emotional capacity)을 향상시키는 중재를 도입하여 감염병 유행 중 병원근로자들의 정서적 혼란을 줄이고 유행 후 회복탄력성을 촉진하여야 한다. 또한, 병원근로자들을 위한 보호적 환경(protective environment) 조성이 필요하다. 부정적 정서를 촉발하여 병원근로자들의 정서적 안정성을 저해하는 요인이 본 논문에서 밝혀진 바 있는데 이들은 관리 차원의 노력을 통해서 그 부정적 영향력이 완화될 필요가 있다. 일반 공중에 대해서는 효과적인 커뮤니케이션 측면에서 함의점이 도출되었다. 감염병 유행 발생 시, 보건 당국은 신속하게 공중의 정서적 반응을 진단하여야 한다. 그리고 이를 기반으로 정확하면서도 정서 맞춤형(emotion-tailored)인 메시지를 시의적절하게 전달하여 공중의 건강한 보호 행동을 증가시킬 필요성이 있다.

주요어: 재난 관리, 감염병 유행, 정서, 병원근로자, 공중
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